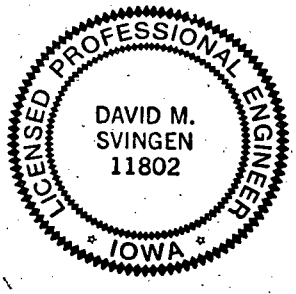
Con 12-1-1
Doc # 31756

AWQ-7(GW)
MSER

ANNUAL MONITORING REPORT 2006
GROUNDWATER QUALITY AND MONITORING WELL PERFORMANCE

PLYMOUTH COUNTY SANITARY LANDFILL
PLYMOUTH COUNTY, IOWA
PERMIT NO. 75-SDP-1-74P

Terracon Project No. 40905033
November 30, 2006



I hereby certify the portion of this engineering document described below was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

David M. Svingen

David M. Svingen Certificate No. 11802

Pages or sheets covered by this seal: Annual Monitoring Report 2006; pages 1 – 20; Appendix A, Figures 1-6; Appendix B; Appendix C, Tables 1-3.

Date Issued: 11/30/2006
License Renewal Date: 12/31/2007

Prepared for:

PLYMOUTH COUNTY SOLID WASTE AGENCY
Plymouth County, Iowa

Prepared by:

TERRACON CONSULTANTS, INC.
Omaha, Nebraska

61271 12/01/06 am10:45

Terracon

Form 101 – 1-87

November 30, 2006

Terracon
Consulting Engineers & Scientists

2211 South 156th Circle
Omaha, Nebraska 68130-2506
Phone 402.330.2202
Fax 402.330.7606
www.terracon.com

Mr. Mark Kunkel
Plymouth County Solid Waste Agency
34898 150th Street
LeMars, IA 51031

Re: Annual Monitoring Report 2006
Groundwater Quality and Monitoring Well Performance
Plymouth County Sanitary Landfill
Plymouth County, Iowa
Permit No. 75-SDP-1-74P
Terracon Project No. 40905033

Dear Mr. Kunkel:

Enclosed is a report for the annual monitoring of groundwater quality and monitoring well performance for the Plymouth County Landfill. This report serves to meet Iowa Department of Natural Resources (IDNR) annual monitoring reporting requirements set forth in IDNR's Regulations for Solid Waste Disposal, Chapter 113. This report does not, however, contain site inspection/special waste authorization information. We understand that site inspection/special waste authorization information is to be reported by Mr. Scott Langel, P.E., the registered design engineer as specified in the landfill's permit (No. 75-SDP-1-74P).

Thank you for the opportunity to be of continued service to you on this project. If there are any questions concerning this report, please contact us.

Sincerely,
TERRACON CONSULTANTS, INC.

Rod Baumann, P.G.
Project Geologist

David M. Svingen, P.E., P.G.
Principal
Iowa License No. 11802

MPD/RMB/DMS:rmb/leb

Enclosure

Copies to: Addressee (1)
Ms. Nina Koger, Solid Waste Section, IDNR, Wallace State Office Building, 900 East Grand Avenue, Des Moines, IA 50319-0034 (1)
IDNR, Field Office No. 3, Gateway North Mall, 1900 North Grand Avenue, Spencer, IA 51031 (1)
Mr. Scott Langel, P.E., 695 Central Avenue NW, LeMars, IA 51031 (1)

TABLE OF CONTENTS

ANNUAL MONITORING REPORT 2006
GROUNDWATER QUALITY AND
MONITORING WELL PERFORMANCE

PLYMOUTH COUNTY SANITARY LANDFILL
PLYMOUTH COUNTY, IOWA
PERMIT NO. 75-SDP-1-74P

Terracon Project No. 40905033
November 30, 2006

1.0 INTRODUCTION

The subject site is an existing landfill operating under Iowa Department of Natural Resources (IDNR) permit number 75-SDP-1-74P, in Plymouth County of northwestern Iowa. The Plymouth County Landfill is located within the NE $^1/_4$ of Section 34, in Township 93 North, Range 45 West, in Plymouth County, Iowa and its location is depicted in Figures 1 and 2 (Appendix A).

Landfill personnel have performed water quality sampling and analysis for the 2006 calendar year at the Plymouth County Landfill. Monitoring consisted of sampling and analyzing groundwater from 12 water table monitoring wells (three up-gradient wells and nine down-gradient wells). The wells are depicted in Figure 3 (Appendix A).

Past sampling and analyses have shown well MW-17 to be appropriate for use as an up-gradient well for making statistical comparisons to the remaining wells at the landfill. Until 2004, there had been no evidence of impact to groundwater at MW-17 from the landfill. However, results from the April 30, 2004 monitoring event revealed 1,1,1-trichloroethane (TCA) at a concentration of 1.44 µg/L. Results from the five subsequent monitoring events showed concentrations of TCA below the reporting limit, indicating that the April 30, 2004 TCA concentration is apparently anomalous. The results from October 5, 2006 show a slightly elevated chemical oxygen demand (COD). Also, specific conductance values appear to have increased over the past two years and remain elevated this year. These data are discussed in more detail in section 3.1. Further monitoring must be conducted to evaluate whether data for COD and specific conductance will demonstrate the beginning of a long term trend or if the data is anomalous. For now, MW-17 will continue to be viewed as a viable up-gradient monitoring point.

Most of the wells at the landfill have been subjected to monitoring for routine annual and semi-annual parameters. Many wells have also been used to monitor for volatile organic compounds (VOCs) in response to a Groundwater Quality Assessment Plan (GWQAP) for assessing the

extent of VOCs detected at several wells during previous monitoring. A summary of whether routine annual and semi-annual parameters and/or specified VOC parameters are required for testing at respective wells is provided below.

Well No.	Routine Semi-Annual and Annual Sampling	GWQAP Semi-Annual Sampling for Specified VOCs
MW-7	Required	Required
MW-8	Required	Required
MW-9	Required	Required
MW-10	Required	Not Required
MW-11	Required	Not Required
MW-12	Required	Required
MW-13	Required	Not Required
MW-14	Required	Required
MW-15	Not Required	Required
MW-16	Not Required	Required
MW-17	Required	Required
MW-18	Not Required	Required

Note: Wells MW-1 through MW-6 have been abandoned.

Laboratory reports, chain-of-custody documentation, and field data forms have been previously submitted to the IDNR by landfill personnel for each semi-annual monitoring event. Copies of these documents are retained at the Plymouth County Landfill. During 2006, groundwater sampling was performed on April 26 and October 5.

2.0 STATISTICAL CONSIDERATIONS

Monitoring well MW-17 was considered as the up-gradient location in the water quality monitoring program. Statistical evaluation of temperature has not been included since temperature data, to a large degree, is dependent upon ambient conditions. Ambient conditions may cause temperature readings to deviate from actual groundwater conditions as a result of the method used to measure groundwater temperatures. Nevertheless, temperatures recorded during the sampling events do not indicate obvious indications of temperature fluctuations that may be the result of endothermic or exothermic chemical reactions.

Control bounds were computed in general accordance with guidelines set forth in IAC 113.26(6). One-half of the laboratory method quantitative limit was used in statistical

computations in instances where chemicals were reported at concentrations below the quantitative limit.

Laboratory analytical summary sheets for each sampling location have been provided in Appendix B. Graphs with control limits showing concentrations versus time for sampling locations are also included in Appendix B. The parameters given statistical consideration include routine semi-annual and annual parameters and select VOC parameters at selected wells as listed below.

Semi-annual Parameters	Annual Parameters	Select VOCs at GWQAP Wells
Chloride	Phenols (Total)	Benzene
Chemical Oxygen Demand	Total Organic Halogens	1,2-Dichloroethane
Iron (dissolved)		1,1-Dichloroethene
Ammonia Nitrogen		1,1,1,-Trichloroethane
pH		Trichloroethene
Specific Conductance		

It should be noted that GWQAP wells that only require sampling for VOCs have been occasionally sampled (inadvertently) for semi-annual and annual parameters, which was not required by the IDNR. Conversely, wells that only require sampling for semi-annual and annual parameters have been occasionally sampled (inadvertently) for VOCs, which was not required by the IDNR. The additional data was included in the Appendix B tables, but may or may not be included in the Appendix B graphs.

3.0 GROUNDWATER IMPACT DISCUSSIONS

Discussion in this section is provided for chemical parameters that fall outside of the upper and lower control limits on a well-by-well basis. Chemical parameters which fall within established control limits are not discussed. Well discussions are presented with well MW-17 being discussed first, since well MW-17 is the up-gradient well used for statistical comparison to other wells. The remaining monitoring well data is discussed in reverse order.

Upper and lower control limits for each of the monitoring wells (MW-7 through MW-18) were based on data obtained for up-gradient well MW-17 as required by IAC Chapter 113.26(6). In some cases, upper and lower control limits are equivalent due to non-detection of certain parameters since monitoring began. In this case, analyte concentrations plot on a single control bound line (no deviation from the mean of the data) instead of between upper and lower control bounds.

3.1 MW-17 (Up-Gradient Well)

Analytes whose concentrations fall outside of the control limits established from up-gradient well MW-17 are as follows:

- **Chloride:** Only one data point (July 1, 1998) plotted above the upper control limit for chloride. Compared to the other data points on the graph, this data point appears to be anomalous and not consistent with other monitoring data.

- **Chemical Oxygen Demand (COD):** Two data points plotted above the upper control limit for chemical oxygen demand. A third data point is marginally below the upper control limit. Compared to the other data points on the graph, these three data points appear to be anomalous and not consistent with other monitoring data.

- **1,2,-Dichloroethane (DCA):** The two recent results for DCA are in excess of the upper control limit due to elevated laboratory quantitative limits, and have caused the formation of an upper and lower control limit. DCA has not been detected at MW-17.

- **1,1,1-Trichloroethane (TCA):** One data point (April 30, 2004) for detected TCA has resulted in the formation of an upper and lower control limit for this chemical. However, the TCA concentration does not exceed the MCL groundwater action level of 200 µg/L.

- **pH:** Only one data point (October 17, 2000) plotted below the lower control limit for pH. Compared to the other data points on the graph, this data point appears to be anomalous and not consistent with other monitoring data.

- **Specific Conductance:** One data point (October 11, 2004) plotted above the upper control limit and one data point (April 26, 2005) plotted below the lower control limit for specific conductance. Continued monitoring will allow for further assessment of potential impact.

3.2 MW-18 (Down-Gradient Well)

Well MW-18 is a relatively new well that was installed during 2005. Groundwater was monitored for GWQAP volatile organic compounds for the first time during the October 2005 semi-annual monitoring event. Volatile organic concentrations analyzed for MW-18 were reported to be below laboratory detection limits for benzene, 1,2-dichloroethane, 1,1-dichloroethene, 1,1,1-trichloroethane, and trichloroethylene.

Analytes whose concentrations fall outside of the control limits established from up-gradient well MW-18 are as follows:

- **1,2,-Dichloroethane (DCA):** The two recent results for DCA are in excess of the upper control limit due to elevated laboratory quantitative limits. DCA has not been detected at MW-18.

- **1,1-Dichloroethene (DCE):** One data point (October 11, 2005) for DCE falls below the upper and lower control bound, which is a single line, due to reduced laboratory quantitative limits for this date. DCE has not been detected at MW-18.

- **Specific Conductance:** The first specific conductance measurement (October 11, 2005) was above 1200 µs/cm which is outside the control limits. In 2006 the specific conductance data dropped significantly and is within the control limits during the 2006 monitoring events. The October 11, 2005 data point appears to be anomalous.

3.3 MW-16 (Up-Gradient Well)

Well MW-16 is a GWQAP well installed for monitoring certain VOC compounds. Analytes whose concentrations fall outside of the control limits established from up-gradient well MW-17 are as follows:

- **1,2,-Dichloroethane (DCA):** The two recent results for DCA are in excess of the upper control limit due to elevated laboratory quantitative limits. DCA has not been detected at MW-16.

- **Trichloroethene (TCE):** Only one data point (April 30, 2004) plotted above the upper control limit for TCE. However, the detected TCE concentration is below the maximum contaminant level (MCL) drinking water standard of 5 µg/l and also appears to be anomalous with respect to other TCE data.

- **Specific Conductance:** One data point (April 30, 2004) plotted above the upper control limit and one data point (April 26, 2005) plotted below the lower control limit for specific conductance. Continued monitoring will allow for further assessment of potential impact.

3.4 MW-15 (Down-Gradient Well)

Well MW-15 is a GWQAP well installed for monitoring certain VOC compounds. Analytes whose concentrations fall outside of the control limits established from up-gradient well MW-17 are as follows:

- **1,2,-Dichloroethane (DCA):** The two recent results for DCA are in excess of the upper control limit due to elevated laboratory quantitative limits. DCA has not been detected at MW-15.

- **Trichloroethene (TCE):** Data has consistently plotted above the upper control limit for TCE since September of 1999 with the exception of one data point (April 30, 2004). However, the detected TCE concentrations are below the maximum contaminant level (MCL) drinking water standard of 5 µg/l.

- **Total Organic Halogens (TOH):** The two test results for this analyte indicate impact to groundwater which is consistent with the detection of TCE discussed above. Note that TOH is a routine annual parameter not required to be tested in groundwater collected from MW-15.

- **pH:** One pH value (for the October 17, 2000 date) plots marginally below the lower control limit. This phenomenon does not appear to be significant.

- **Specific Conductance:** Data for this analyte plotted rather consistently above the upper control bound established by up-gradient well MW-17. Based on indications of the TCE present in the groundwater, as stated above, the elevated specific conductance appears to be indicative of landfill leachate impacting groundwater at MW-15.

3.5 MW-14 (Down-Gradient Well)

Analytes whose concentrations fall outside of the control limits established from up-gradient well MW-17 are as follows:

- **Chloride:** Each of the data points plotted above the upper control limit for chloride. Based on other indications of groundwater impact at well MW-14 (i.e. VOCs), the elevated chloride concentrations appear to be indicative of impact from the landfill.

- **Chemical Oxygen Demand (COD):** The July 12, 1996 data point plotted above the upper control limit for chemical oxygen demand. Compared to the other data points on the graph, this data point appears to be anomalous and not consistent with other

monitoring data. More recent data, in 2002, 2003, and 2006 accounts for three data points plotting above the upper control limit. The relatively recent chemical oxygen demand detections may be indicative of groundwater impact.

- **Ammonia Nitrogen:** The April 30, 2004 data point plotted above the upper control limit for ammonia nitrogen. Compared to the other data points on the graph, this data point appears to be anomalous and not consistent with other monitoring data.

- **Dissolved Iron:** The March 25, 2001 data point plotted above the upper control limit for dissolved iron. Compared to the other data points on the graph, this data point appears to be anomalous and not consistent with other monitoring data.

- **Benzene:** Two early data points plot above the upper control bound limit because the laboratory detection levels were elevated for these sample dates. However, a recent data point (April 30, 2004) plots above the upper control bound but appears to be anomalous with respect to other analytical data. Also, the anomalous data point concentration is below the maximum contaminant level (MCL) of 5 µg/L .

- **1,2-Dichloroethane (DCA):** Eight data points plot above the upper control limit for DCA. Three of the occurrences in excess of the upper control limit are due to elevated laboratory quantitative limits. However, five exceedances were due to detections of DCA marginally above detection limits which are above the negligible risk level (NRL) of 0.4 µg/L but below the maximum contaminant level (MCL) of 5 µg/L.

- **1,1-Dichloroethene (DCE):** DCE was not detected at MW-14. Two early data points plot below the lower control bound limit because the laboratory detection levels were lower for these sample dates relative to subsequent data analyses.

- **1,1,1-Trichloroethane (TCA):** Four data points plot above the upper control limit for TCA. However, TCA concentrations do not exceed the MCL groundwater action level of 200 µg/L.

- **Trichloroethene (TCE):** Most of the data points plot above the upper control limit for TCE. However, none of the data points exhibited a concentration exceeding the MCL groundwater action level of 5 µg/L.

- **Total Organic Halogens (TOH):** Most of the data points plot above the upper control limit for TOH. These results are consistent with VOC detections as stated above.

- **Specific Conductance:** Most of the data points plotted above the upper control limit for specific conductance. Based on other indications of groundwater impact at well MW-14 (i.e. VOCs), the elevated specific conductance concentrations appears to be indicative of impact from the landfill.

3.6 MW-13 (Down-Gradient Well)

Analytes whose concentrations fall outside of the control limits established from up-gradient well MW-17 are as follows:

- **Chloride:** Each of the data points plotted above the upper control limit for chloride. Based on other indications of groundwater impact at well MW-13 (TOH, dissolved iron, and arsenic detected during the first year of monitoring not covered in this report), the elevated chloride concentrations appear to be indicative of impact from the landfill.

- **Chemical Oxygen Demand (COD):** Several data points, including the most recent, plot above the upper control limit for chemical oxygen demand. Based on other indications of groundwater impact at well MW-13 (TOH, dissolved iron, and arsenic detected during the first year of monitoring not covered in this report), the data may be indicative of impact from the landfill.

- **Ammonia Nitrogen:** The April 12, 2000 data point plotted above the upper control limit for ammonia nitrogen. Compared to the other data points on the graph, this data point appears to be anomalous and not consistent with other monitoring data.

- **Iron:** Many of the data points plotted above the upper control limit for iron. Based on other indications of groundwater impact at well MW-13 ((TOH, chloride, and arsenic detected during the first year of monitoring not covered in this report)), the elevated iron concentrations may be indicative of impact from the landfill.

- **Benzene:** Benzene was not detected at MW-13. Two early data points plot above the upper control bound limit because the laboratory detection levels were elevated for these sample dates. This analyte has not been tested for at this well since 2003 because well MW-13 is not a GWQAP well that requires VOC monitoring.

- **1,2-Dichloroethane (DCA):** DCA was not detected at MW-13. One data point plotted above the upper control limit for DCA. The exceedance is due to elevated laboratory detection limits. This analyte has not been tested for at this well since 2003 because well MW-13 is not a GWQAP well that requires VOC monitoring.

- **1,1-Dichloroethene (DCE):** DCE was not detected at MW-13. Two early data points plot below the lower control bound limit because the laboratory detection levels were lower for these sample dates relative to subsequent data analyses. This analyte has not been tested for at this well since 2003 because well MW-13 is not a GWQAP well that requires VOC monitoring.

- **Total Organic Halogens (TOH):** TOH was detected durinr three past monitoring events. Specific VOCs have not been detected in groundwater at MW-13. Continued monitoring will allow for further assessment of potential TOH impact at well MW-13.

- **pH:** One historic data point falls marginally below the lower control bound limit. This one-time deviation from within the control bound limits is not considered to be of significance.

- **Specific Conductance:** One of the data points plotted above the upper control limit for specific conductance. This one-time deviation from within the control bound limits is not considered to be of significance.

3.7 MW-12 (Down-Gradient Well)

Analytes whose concentrations fall outside of the control limits established from up-gradient well MW-17 are as follows:

- **Chloride:** Each of the data points plotted above the upper control limit for chloride. Based on other indications of groundwater impact at well MW-12 (i.e. VOCs and total organic halogens), the elevated chloride concentrations appear to be indicative of impact from the landfill.

- **Chemical Oxygen Demand (COD):** Five data points plotted above the upper control limit for specific conductance. COD data appears to be sporadic, inconsistent, and alternates between non-detected values and detected values that may or may not exceed the upper control limit.

- **Ammonia Nitrogen:** The October 19, 1998 data point plotted above the upper control limit. Compared to the other data points on the graph, this data point appears to be anomalous and not consistent with other monitoring data.

- **Iron:** Data points for the past for semi-annual monitoring events plotted above the upper control limit. Based on other indications of groundwater impact at well MW-12 (i.e. various VOCs and chloride), the elevated iron concentrations may be indicative of impact from the landfill. Continued monitoring should provide an indication of the significance of the recent dissolved iron detections.

- **Benzene:** Most of the data points plot above the upper control limit for benzene with the exception of one (April 30, 2004). The exceedances were due to detections of benzene at concentrations which are above the negligible risk level (NRL) groundwater action level of 1.0 µg/L but below the maximum contaminant level (MCL) of 5 µg/L.

- **1,2-Dichloroethane (DCA):** The April 30, 2004 data point plotted above the upper control limit for DCA. Compared to the other data points on the graph, this data point appears to be anomalous and not consistent with other monitoring data. The two points from 2006 are above the upper control limit due to an increase in the laboratory quantitative limit for 1,2-Dichloroethane.

- **1,1-Dichloroethene (DCE):** DCE was not detected at MW-12. One early data point plots below the lower control bound limit because the laboratory detection levels were lower for this sample date relative to subsequent data analyses.

- **1,1,1-Trichloroethane (TCA):** Three data points plot above the upper control limit for TCA. However, TCA concentrations do not exceed the maximum contaminant level (MCL) groundwater action level of 200 µg/L.

- **Trichloroethene (TCE):** Each data point plots above the upper control limit for TCE. Many of these data points exhibited a concentration exceeding the negligible risk level (NRL) of 3 µg/L and the maximum contaminant level (MCL) of 5 µg/L, but only marginally.

- **Total Organic Halogens (TOH):** Each of the data points plot above the upper control limit for TOH. These results are consistent with VOC detections as stated above.

- **pH:** Most measured pH values are between control limits with the exception of a few pH values which plot at or marginally below the lower control limit. One data point that plotted below the lower control limit exhibited a pH value of 5.0. The 5.0 pH value appears to be anomalously low and not consistent with other measured pH values.

- **Specific Conductance:** Most of the data points plotted above the upper control limit for specific conductance. Based on other indications of groundwater impact at well MW-12 (i.e. VOCs and total organic halogens), the elevated specific conductance concentrations appear to be indicative of impact from the landfill.

3.8 MW-11 (Down-Gradient Well)

Analytes whose concentrations fall outside of the control limits established from up-gradient well MW-17 are as follows:

- **Chloride:** All of the data points plotted above the upper control limit for chloride. The elevated chloride concentrations may be indicative of impact from the landfill.

- **Chemical Oxygen Demand (COD):** Two data points (October 6, 2002 and October 10, 2006) plot above the upper control limit for chemical oxygen demand. Compared to the other data points on the graph, these data points may be anomalous and not consistent with other monitoring data.

- **Ammonia Nitrogen:** The October 11, 2004 data point plotted above the upper control limit. Compared to the other data points on the graph, this data point appears to be anomalous and not consistent with other monitoring data.

- **Iron:** The July 12, 1996 data point plotted above the upper control limit. Compared to the other data points on the graph, the suspect data point appears to be anomalous and not consistent with other monitoring data. Continued monitoring subsequent to the July 12, 1996 date indicates that iron concentrations at MW-11 have exceeded the upper control limit on one other occasion (April 25,2006).

- **Benzene:** Benzene was not detected at MW-11. Two early data points plotted above the upper control bound limit because the laboratory detection levels were elevated for these sample dates. This analyte has not been tested for at this well since 2003 because well MW-11 is not a GWQAP well that requires VOC monitoring.

- **1,2-Dichloroethane (DCA):** DCA was not detected at MW-11. One early data point plotted above the upper control bound limit because the laboratory detection level was elevated for that sample date. This analyte has not been tested for at this well since 2003 because well MW-11 is not a GWQAP well that requires VOC monitoring.

- **1,1-Dichloroethene (DCE):** DCE was not detected at MW-11. Two early data points plotted below the lower control bound limit because the laboratory detection levels were lower for these sample dates relative to subsequent data analyses. This analyte has not been tested for at this well since 2003 because well MW-11 is not a GWQAP well that requires VOC monitoring.

- **Total Organic Halogens (TOH):** Two early data points plot above the upper control limit for TOH. Continued monitoring subsequent to these dates indicates that TOH concentrations at MW-11 have not been detected.

- **Specific Conductance:** Several data points plotted above the upper control limit for specific conductance. The data appears to indicate an upward trend in specific conductance values. The elevated specific conductance concentrations may be indicative of impact from the landfill.

3.9 MW-10 (Down-Gradient Well)

Analytes whose concentrations fall outside of the control limits established from up-gradient well MW-17 are as follows:

- **Chloride:** Each of the data points plotted above the upper control limit for chloride. Based on total organic halogen detections as discussed below, the elevated chloride concentrations appear to be indicative of impact from the landfill.

- **Chemical Oxygen Demand (COD):** Two values which plot above the upper control limit for chemical oxygen demand appear to be anomalous. The recent data point from October of 2006 shows an COD value slightly above the upper control limit.

- **Ammonia Nitrogen:** The August 9, 1996 data point plotted above the upper control limit. Compared to the other data points on the graph, this data point appears to be anomalous and not consistent with other monitoring data. Continued monitoring subsequent to August 9, 1996 indicates that ammonia nitrogen concentrations at MW-10 have not been detected.

- **Iron:** The April 17, 1997 data point plotted above the upper control limit. Other data points on the graph did not exhibit detectable iron concentrations. The one-time detection of iron in well MW-10 appears to be anomalous.

- **Benzene:** Benzene was not detected at MW-10. Two early data points plotted above the upper control bound limit because the laboratory detection levels were

elevated for these sample dates. This analyte has not been tested for at this well since 2003 because well MW-10 is not a GWQAP well that requires VOC monitoring.

- **1,2-Dichloroethane (DCA):** DCA was not detected at MW-10. One early data point plotted above the upper control limit because the laboratory detection level was elevated for that sample date. This analyte has not been tested for at this well since 2003 because well MW-10 is not a GWQAP well that requires VOC monitoring.

- **1,1-Dichloroethene (DCE):** DCE was not detected at MW-10. Two early data points plotted below the lower control bound limit because the laboratory detection levels were lower for these sample dates relative to subsequent data analyses. This analyte has not been tested for at this well since 2003 because well MW-10 is not a GWQAP well that requires VOC monitoring.

- **Trichloroethene (TCE):** One data point plotted above the upper control limit for TCE. However, the elevated TCA concentration does not exceed the negligible risk level (NRL) of 3 µg/L or the maximum contaminant level (MCL) of 5 µg/L and also appears to be anomalous with respect to the other non-detectable TCE concentrations. This analyte has not been tested for at this well since 2003 because well MW-10 is not a GWQAP well that requires VOC monitoring.

- **Phenols:** The earliest and most recent data points plotted above the upper control bound established by up-gradient well MW-17 for total phenols. These detected phenol concentrations appear to be anomalous.

- **Total Organic Halogens (TOH):** Several of the data points plot above the upper control limit for TOH. These results may be indicative of landfill impact to groundwater.

- **Specific Conductance:** Most of the data points plotted near, but below, the upper control limit. The three most recent data points plotted above the upper control limit. Further monitoring will be necessary to evaluate the significance of the most recent data points.

3.10 MW-9 (Down-Gradient Well)

Well MW-9 had not produced a sufficient amount of water for sampling from 2000 to 2004. The discussion below is based on data generated through monitoring which occurred prior to 2000 and since October of 2004. Analytes whose concentrations fall outside of the control limits established from up-gradient well MW-17 are as follows:

- **Chloride:** Each of the data points plotted above the upper control limit for chloride. Based on detections of VOCs and total organic halogens, as stated below, the elevated chloride concentrations appear to be indicative of impact from the landfill.

- **Ammonia Nitrogen:** The October 11, 2004 data point plotted above the upper control limit. Compared to the other data points on the graph, this data point appears to be anomalous and not consistent with other monitoring data.

- **Benzene:** Benzene was not detected at MW-9. One early data point plotted above the upper control bound limit because the laboratory detection levels were elevated for that sample date.

- **1,2-Dichloroethane (DCA):** Five data points plot above the upper control limit for DCA. Three of the five exceedances were due to detections of DCA. Two of the five exceedances were due to elevated laboratory quantitation limits. The exceedances were either at or marginally above the negligible risk level (NRL) of 0.4 µg/L. The exceedances are, however, below the maximum contaminant level (MCL) of 5 µg/L.

- **1,1-Dichloroethene (DCE):** DCE was not detected at MW-9. One early data point plotted below the lower control bound limit because the laboratory detection level was lower for this sample date relative to subsequent data analyses.

- **Phenols:** The earliest of five phenol data points plotted above the upper control limit for phenol. The phenol concentration above the upper control limit appears to be anomalous. However, further monitoring is necessary to evaluate whether future detections indicate phenol impact to groundwater at well MW-9.

- **Total Organic Halogen (TOH):** Three of five data points plot above the upper control limit for TOH. These results are consistent with DCA detections as stated above.

- **Specific Conductance:** Most of the data points plot above the upper control limit for specific. Based on other indications of groundwater impact at well MW-9 (i.e. select VOCs and total organic halogens), the elevated specific conductance concentrations appear to be indicative of impact from the landfill.

3.11 MW-8 (Down-Gradient Well)

Analytes whose concentrations fall outside of the control limits established from up-gradient well MW-17 are as follows:

- **Chloride:** All of the data points plotted above the upper control limit for chloride. Based on detections of VOCs and TOH at this well, as discussed below, the elevated chloride concentrations appear to be indicative of impact from the landfill.

- **Chemical Oxygen Demand (COD):** Two data points plotted marginally above the upper control limit. These data points and several other COD detections in well MW-8 may indicate impact to groundwater from the landfill.

- **Ammonia Nitrogen:** The April 30, 2004 data point plotted above the upper control limit. Compared to the other data points on the graph, this data point appears to be anomalous and not consistent with other monitoring data.

- **Iron:** Four data points plotted marginally above the upper control limit. Other data points on the graph did not exhibit detectable iron concentrations. Recent iron monitoring data does not indicate impact from the landfill.

- **Benzene:** Most of the data points plot above the upper control limit for benzene. The exceedances were due to detections of benzene which are above the negligible risk level (NRL) of 1.0 µg/L but below the maximum contaminant level (MCL) of 5 µg/L.

- **1,2-Dichloroethane (DCA):** Most of the data points plot above the upper control limit for DCA. The exceedances were due to detections of DCA which are above the negligible risk level (NRL) of 0.4 µg/L but below the maximum contaminant level (MCL) of 5 µg/L.

- **1,1-Dichloroethene (DCE):** The October 11, 1996 data point plotted above the upper control bound limit. Compared to the other data points on the graph, this data point appears to be anomalous and not consistent with other monitoring data. Continued monitoring subsequent to the October 11, 1996 sampling date indicates that DCE concentrations at MW-8 have not been detected.

- **Trichloroethene (TCE):** All data points plotted above the upper control limit for TCE. The exceedances were due to detections of TCE which are above the

negligible risk level (NRL) of 3.0 µg/L and above the maximum contaminant level (MCL) of 5.0 µg/L but appear to be exhibiting a decreasing concentration trend.

- **Phenols:** The earliest phenol data point plotted above the upper control limit for phenol. It appears that the detected phenol concentration may be anomalous.

- **Total Organic Halogen (TOH):** Each of the data points plot above the upper control limit for TOH. These results are consistent with DCA and TCE detections as stated above.

- **pH:** Two historic data points fall marginally below the lower control bound limit. These deviations from within the control bound limits is not considered to be of significance.

- **Specific Conductance:** Most of the data points plotted above the upper control limit for specific conductance. Based on other indications of groundwater impact at well MW-8 (i.e. VOCs and total organic halogens), the elevated specific conductance concentrations may be indicative of impact from the landfill.

3.12 MW-7 (Up-Gradient Well)

Analytes whose concentrations fall outside of the control limits established from up-gradient well MW-17 are as follows:

- **Chloride:** Many chloride data points plot marginally above the upper control limit for chloride. These marginal exceedences may be indicative of impact from the landfill.

- **Chemical Oxygen Demand (COD):** The July 12, 1996 data point plotted above the upper control limit and appears to be anomalous and not consistent with other monitoring data. More recent data indicates some chemical oxygen demand detections that are plotted marginally above the upper control limit, which may indicate impact from landfill leachate.

- **Ammonia Nitrogen:** Two data points plot above the upper control bound but are not consistent with other data which indicates ammonia has not been detected. Recent data indicates that ammonia concentrations which plotted above the upper control bound appear to be anomalous.

- **Iron:** Three data points plotted marginally above the upper control limit for iron. Other data points on the graph did not exhibit detectable iron concentrations. Recent iron monitoring data does not indicate impact from the landfill.

- **Benzene:** Two early data points plotted above the upper control limit for benzene because the laboratory detection levels were elevated for these sample dates. Many later data points also plotted above the upper control limit due to detections of benzene which are at or below the negligible risk level of 1.0 µg/L and below the maximum contaminant level of 5.0 µg/L.

- **1,2-Dichloroethane (DCA):** Two early data points plotted above the upper control limit. The elevated DCA values appear to be anomalous and not consistent with other monitoring data. Continued monitoring subsequent to the elevated data points indicates that DCA concentrations at MW-7 have not been detected.

- **1,1-Dichloroethene (DCE):** DCE was not detected at MW-7. However, two early data points plotted below the lower control bound limit because the laboratory detection level was lower for these sample dates relative to subsequent data analyses.

- **Trichloroethene (TCE):** All of the data yeilds points which plott above the upper control limit for TCE. The exceedances were due to detections of TCE which are above the negligible risk level of 3.0 µg/L and above the maximum contaminant level (MCL) of 5.0 µg/L.

- **Total Organic Halogen (TOH):** Most of the data points plotted above the upper control limit for TOH. These results are consistent with TCE detections as stated above.

- **pH:** Two data points plot below the lower control limit, but do not significantly deviate from the control bounds.

- **Specific Conductance:** Most of the data points plot above the upper control limit for specific conductance. Based on other indications of groundwater impact at well MW-7 (i.e. VOCs and total organic halogens), the elevated specific conductance concentrations appear to be indicative of impact from the landfill.

4.0 MONITORING WELL PERFORMANCE

The current site monitoring instruments were evaluated in general accordance with the approved Hydrologic Monitoring System Plan, dated October 23, 1998. The purpose of this evaluation was to assess whether the integrity of groundwater monitoring instruments is sufficient to adequately monitor groundwater at the landfill as described in the approved HMSP.

4.1 Well Location Evaluation [110.9(2)a]

For the 2006 calendar year, groundwater elevation measurement events for 12 water table monitoring wells (MW-7 through MW-18) were conducted monthly by landfill personnel. The 12 wells are depicted in Figure 3 (Appendix A). The results of these events have been tabulated in Table 1 (Appendix C).

Water levels at individual wells have exhibited seasonal fluctuations over the past year. As can be seen from Table 1 (Appendix C), water levels were measured to be within the screened interval at most monitoring wells during calendar year 2006.

Well MW-9 was not used for monitoring for several years because it had been dry from 1999 to 2004. Water table levels have been above the base of the screened interval at MW-9 during the April and October monitoring periods since late 2004. Due to fluctuations in the seasonal water table during 2006, water levels rose above the screened interval in only one well, well MW-17, as indicated in Table 1 (Appendix C). The water level in well MW-17 rose above the screened interval by less than a foot three times during 2006 monthly water level measurements.

Ideally, water levels should be within the screened interval for water table monitoring wells, particularly to monitor for the presence of light non-aqueous phase liquids (LNAPLs) which collect at the water table surface. However, evidence to indicate the presence of NAPLs at the monitoring wells was not observed in 2005. As long as such evidence of NAPL presence is not observed when the water table is within a few feet above the top of the screened interval, the well will suffice as a viable groundwater monitoring point.

The general direction of groundwater flow was evaluated for each month's data. The general groundwater flow direction has not changed since groundwater flow was assessed in 1991 for the hydrogeologic assessment. To demonstrate this finding, water level data from three arbitrarily selected monitoring dates was used to construct water table contour maps (Figures 4, 5, and 6, Appendix A). The inferred groundwater flow direction shown on these maps is similar to the inferred groundwater flow direction depicted on maps presented in the hydrogeologic assessment report and previous annual groundwater monitoring reports.

Based on the above findings, the monitoring wells' positioning, with respect to well depth (vertical) and also with respect to location along the buried waste perimeter (lateral), continues to be adequate. Up-gradient and down-gradient well designations as described in the HMSP should continue to be used.

4.2 Effects of Landfill Operations on Hydrogeologic Setting [110.9(2)b]

Methods for landfilling of solid waste during 2006 have not varied significantly from original landfilling methods employed when landfilling commenced in 1975. Based on groundwater information discussed above in Section 4.1, it does not appear that landfill operations are altering the hydrogeologic setting at the landfill site.

4.3 Well Sedimentation [110.9(2)c]

According to the approved HMSP, well depths need to be measured annually to evaluate if the wells are physically intact and not filling with sediment. Well depths were measured during semi-annual monitoring events and recorded on IDNR form 542-1322 which accompanied semi-annual analytical reports submitted to the IDNR and retained at the landfill. The results of these measurements, when compared with well depths depicted on boring logs included in the hydrogeologic assessment report (dated April 26, 1991) and the HMSP (dated October 23, 1998), show that significant silting of site monitoring instruments has not occurred.

4.4 Periodic In-Situ Permeability Tests [110.9(2)d]

According to the approved HMSP, hydraulic conductivities are to be evaluated at monitoring instruments once every five years. Hydraulic conductivity evaluation of the monitoring instruments was performed during 1991, 1998, and 2003. Summaries of hydraulic conductivity testing are documented in Table 3 (Appendix C). Continued hydraulic conductivity testing is not scheduled to take place until 2008.

5.0 LEACHATE WELL MONITORING

Leachate levels were measured monthly by landfill personnel during 2006 with the exceptions of April, May, and November. Results of leachate measurements made at leachate wells (LW-1, LW-2, LW-3, and LW-4) are summarized in Table 2 (Appendix C). Locations of leachate wells are depicted in Figure 3 (Appendix A).

Leachate was detected in three of the four leachate wells during 2006. The most significant leachate thicknesses were measured in well LW-3, which were on the order of five to seven feet. Leachate at well LW-3 has been pumped from the well and temporarily stored in 55-gallon

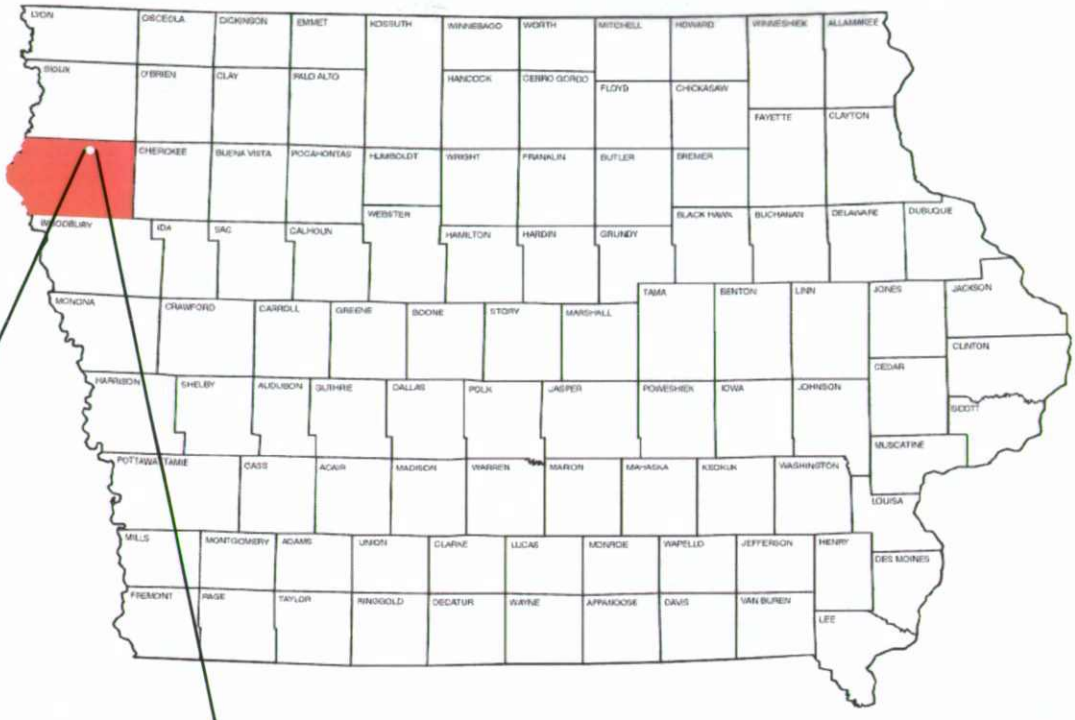
drums at the LW-3 location. Permission has reportedly been granted by the IDNR to transfer the containerized leachate to the landfill's newly constructed leachate collection pond.

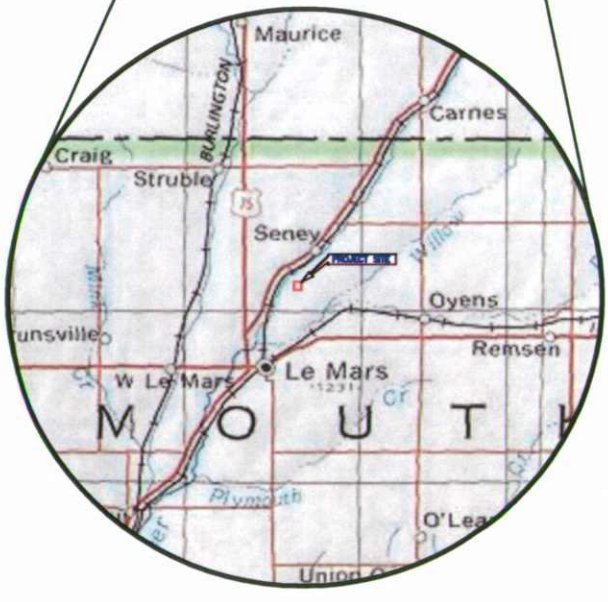
6.0 GENERAL COMMENTS

The analysis and opinions expressed in this report are based upon data obtained from the monitoring wells installed at the indicated locations and from any other information discussed in this report. This report does not reflect any variations in subsurface chemistry, stratigraphy, or geohydrology which may occur between borings or across the site. Actual subsurface conditions may vary and may not become evident without further exploration.

This report is prepared for the exclusive use of the Plymouth County Solid Waste Agency for specific application to the project discussed and has been prepared in accordance with generally accepted environmental engineering practices. No warranties, either express or implied, are intended or made. In the event any changes in the nature or location of observed conditions as outlined in this report are found, this report cannot be considered valid unless these changes are reviewed and the opinions of this report are modified or verified in writing by Terracon.

Appendix A



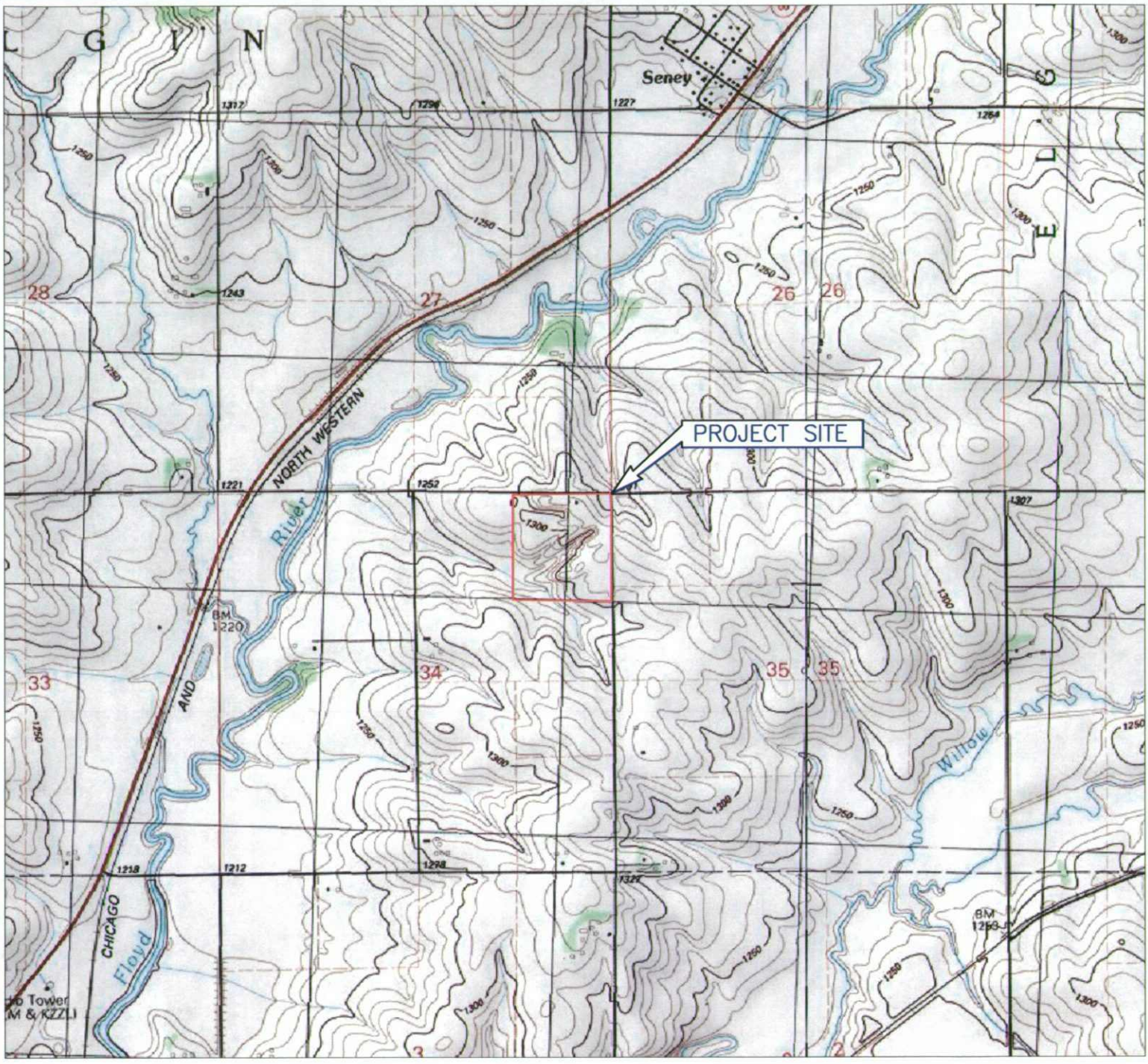


N

RO PAI 11/21/06

LOCATION DIAGRAM
PLYMOUTH COUNTY LANDFILL
PLYMOUTH COUNTY, IOWA

Project Mngr: RMB	Terracon	Project No. 40905033
Designed By: RMB		Scale: NOT TO SCALE
Drawn By: PAI	2211 S. 156th Circle Omaha, NE 68130	File No. 40905033C01
Checked By: RMB		Date: NOVEMBER 2006
Approved By: RMB	Figure No. 1	



1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

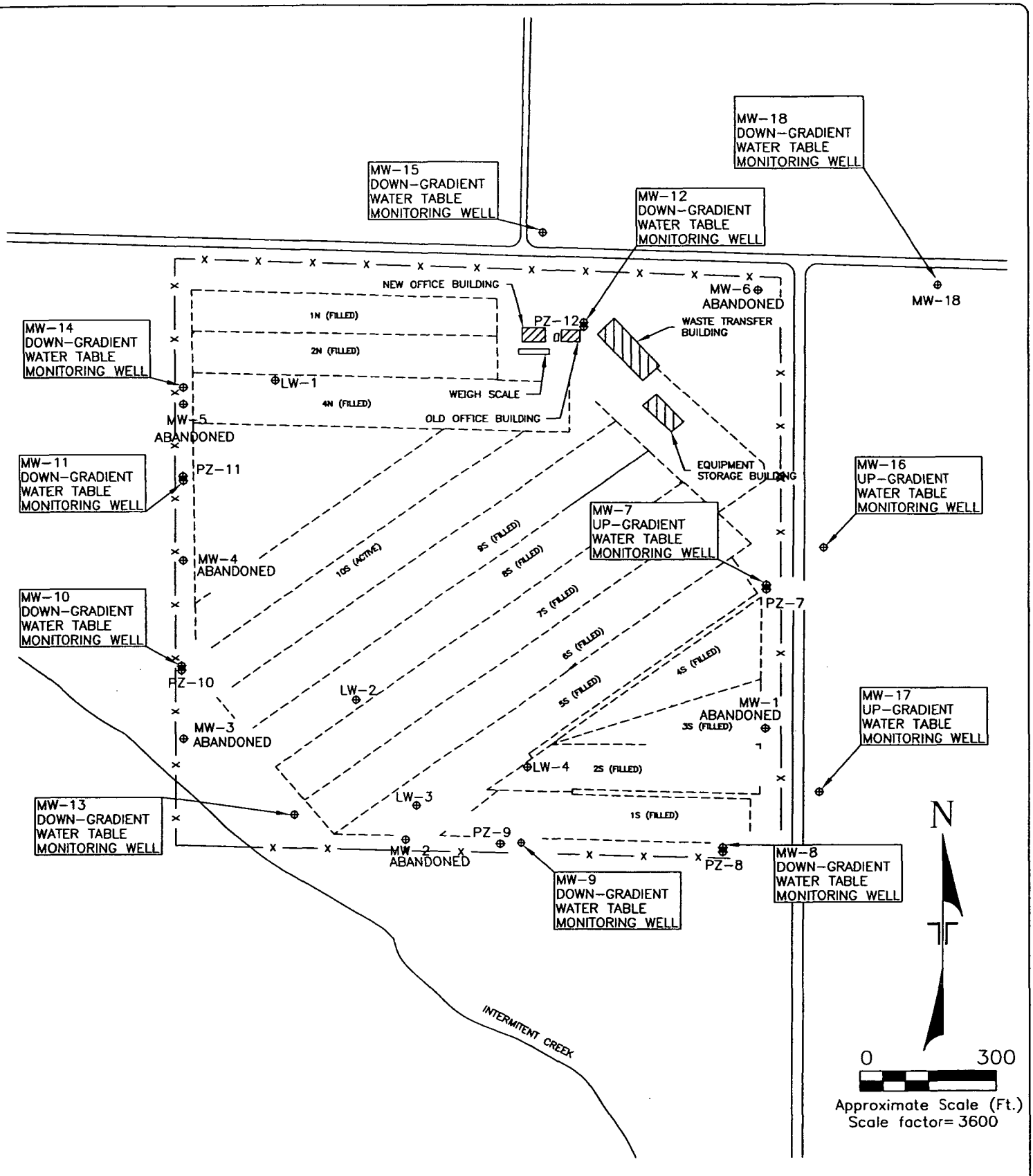
N

NOTES:
REPRODUCED FROM THE LE MARS, IA USGS 7.5–MINUTE TOPOGRAPHIC MAP DATED 1985.

R0 PAI 11/21/06

TOPOGRAPHIC/LOCATION MAP
PLYMOUTH COUNTY LANDFILL
LE MARS, IOWA

Project Mngr: RMB	Terracon		Project No. 40905033
Designed By: RMB			Scale: AS SHOWN
Drawn By: PAI	2211 S. 156th Circle Omaha, NE 68130		File No. 40905033C01
Checked By: RMB			Date: NOVEMBER 2006
Approved By: RMB	Figure No. 2		



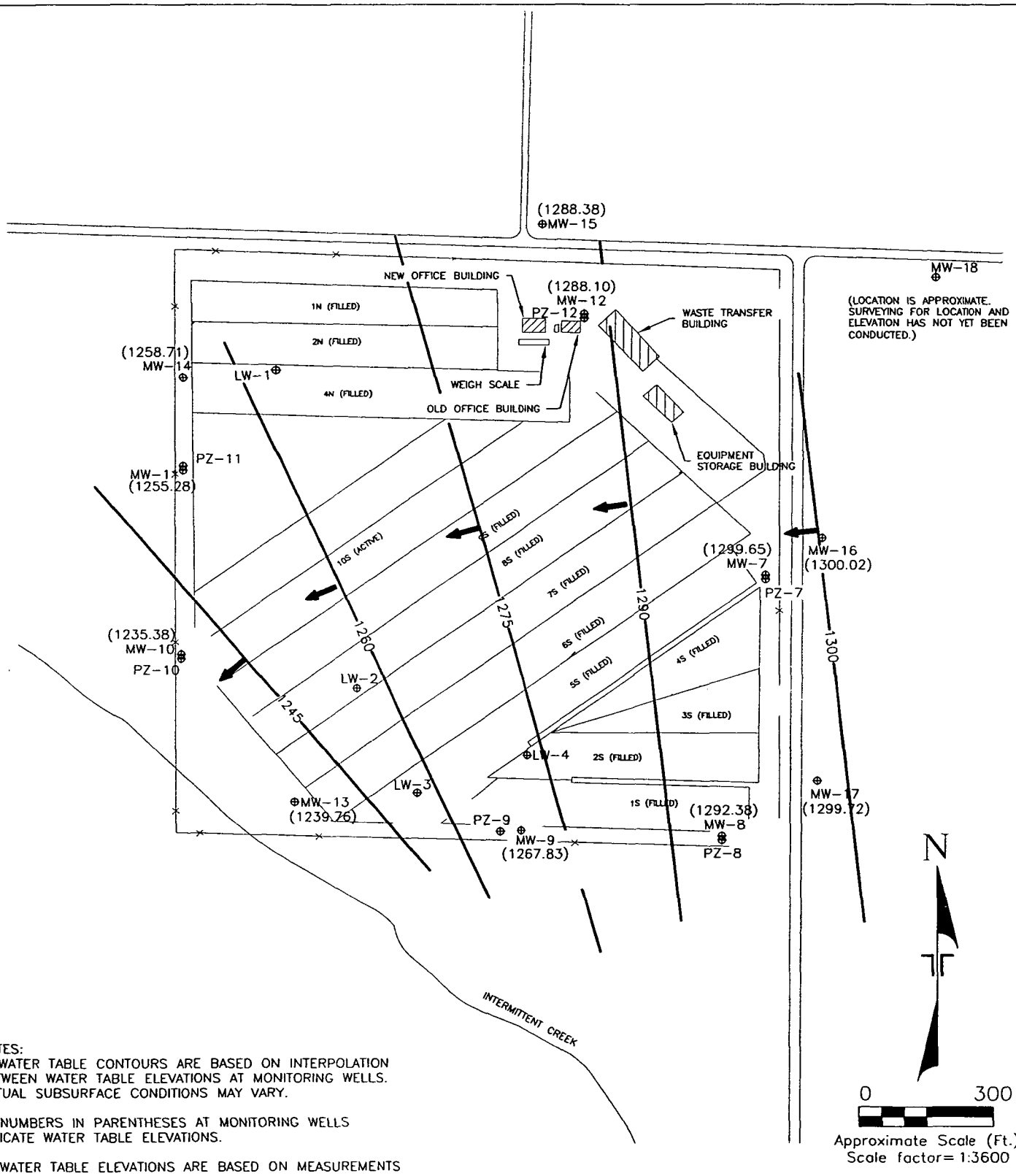
LEGEND

- ⊕ MONITORING INSTRUMENT
- —— x —— FENCE LINE
- BUILDING

R5 PAI 11/21/06

HMSP
MONITORING WELL LOCATIONS
PLYMOUTH COUNTY LANDFILL
PLYMOUTH COUNTY, IOWA

Project Mngr: RMB	Terracon		Project No. 40905033
Designed By: RMB			Scale: 1"=300'
Drawn By: JTW	2211 S. 156th Circle Omaha, NE 68130		File No. 0E033R43
Checked By: RMB			Date: NOVEMBER 2005
Approved By: DMS	Figure No.		3



NOTES:
1. WATER TABLE CONTOURS ARE BASED ON INTERPOLATION BETWEEN WATER TABLE ELEVATIONS AT MONITORING WELLS. ACTUAL SUBSURFACE CONDITIONS MAY VARY.

2. NUMBERS IN PARENTHESES AT MONITORING WELLS INDICATE WATER TABLE ELEVATIONS.

3. WATER TABLE ELEVATIONS ARE BASED ON MEASUREMENTS TAKEN ON JANUARY 18, 2006.

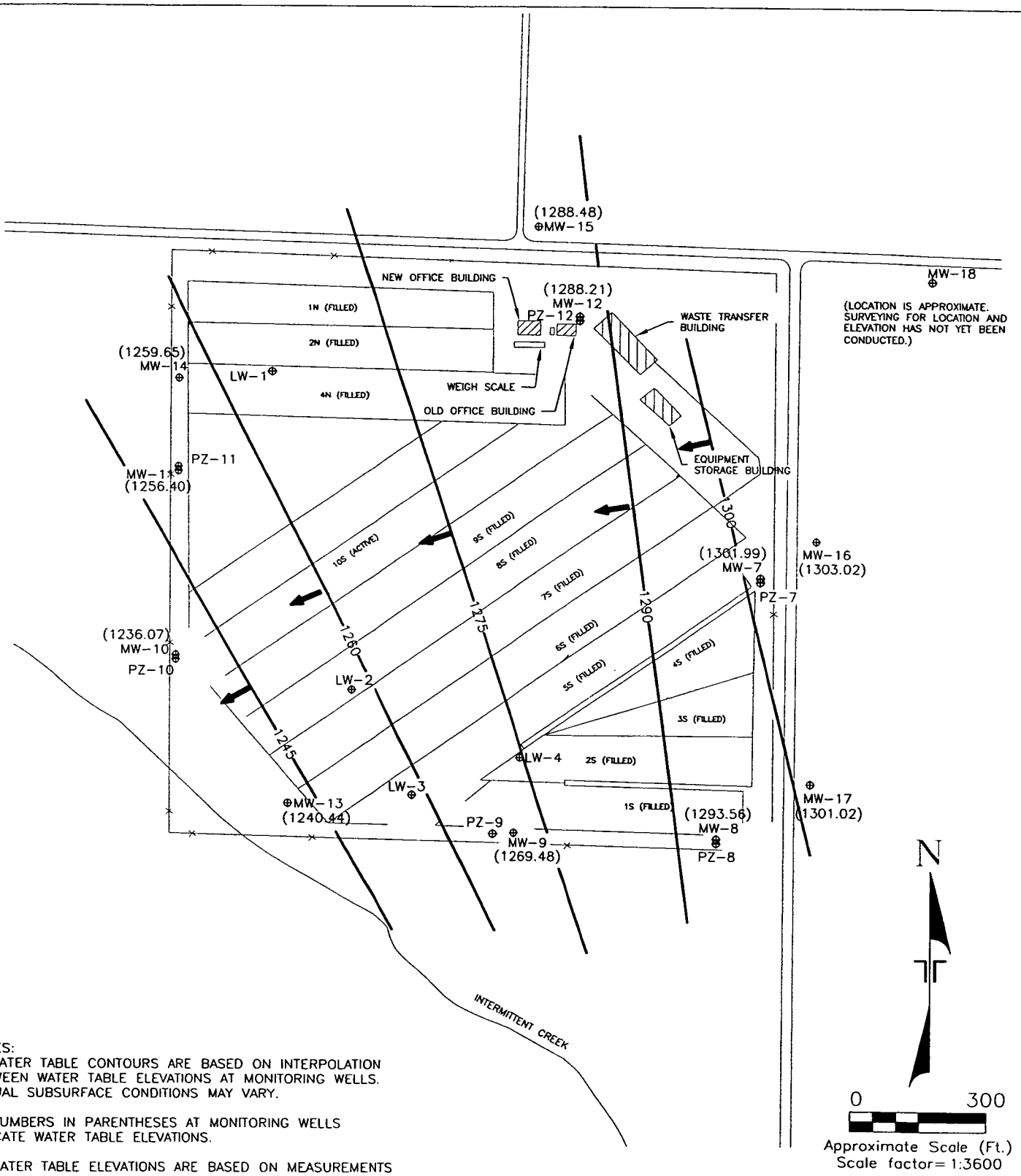
LEGEND

- ⊕ MONITORING INSTRUMENT
- ➡ INFERRED GROUNDWATER FLOW DIRECTION
- —1265— WATER TABLE CONTOUR
- —— x —— FENCE LINE
- BUILDING

R7 BCB 11/17/06

WATER TABLE CONTOUR MAP
JANUARY 18, 2006
PLYMOUTH COUNTY LANDFILL
PLYMOUTH COUNTY, IOWA

Project Mngr: RMB	Terracon		Project No. 40905033
Designed By: RMB			Scale: AS SHOWN
Drawn By: LWT	2211 South 156th Circle Omaha, NE 68130		File No. 0E033R49
Checked By: RMB			Date: NOVEMBER 2006
Approved By: DMS		Figure No.	4



NOTES:
1. WATER TABLE CONTOURS ARE BASED ON INTERPOLATION BETWEEN WATER TABLE ELEVATIONS AT MONITORING WELLS. ACTUAL SUBSURFACE CONDITIONS MAY VARY.

2. NUMBERS IN PARENTHESES AT MONITORING WELLS INDICATE WATER TABLE ELEVATIONS.

3. WATER TABLE ELEVATIONS ARE BASED ON MEASUREMENTS TAKEN ON JULY 24, 2006.

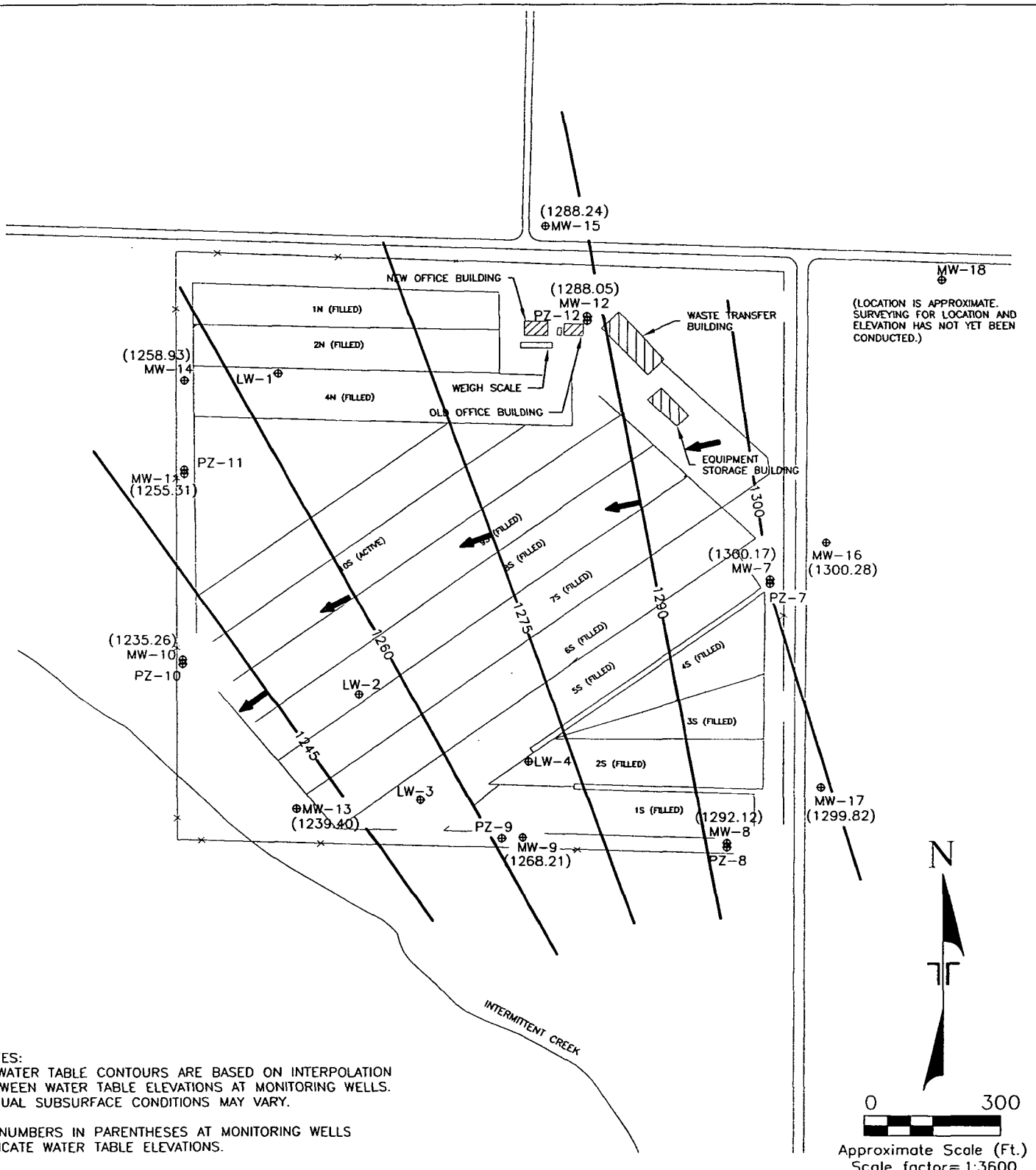
LEGEND

- ⊕ MONITORING INSTRUMENT
- ➡ INFERRED GROUNDWATER FLOW DIRECTION
- —1265— WATER TABLE CONTOUR
- —— FENCE LINE
- BUILDING

R8 BCB 11/17/06

WATER TABLE CONTOUR MAP
JULY 24, 2006
PLYMOUTH COUNTY LANDFILL
PLYMOUTH COUNTY, IOWA

Project Mngr: RMB	Terracon		Project No. 40905033
Designed By: RMB			Scale: AS SHOWN
Drawn By: LWT	2211 South 156th Circle Omaha, NE 68130		File No. 0E033R50
Checked By: RMB			Date: NOVEMBER 2006
Approved By: DMS	Figure No. 5		



NOTES:
1. WATER TABLE CONTOURS ARE BASED ON INTERPOLATION BETWEEN WATER TABLE ELEVATIONS AT MONITORING WELLS. ACTUAL SUBSURFACE CONDITIONS MAY VARY.

2. NUMBERS IN PARENTHESES AT MONITORING WELLS INDICATE WATER TABLE ELEVATIONS.

3. WATER TABLE ELEVATIONS ARE BASED ON MEASUREMENTS TAKEN ON SEPTEMBER 19, 2006.

LEGEND

- ⊕ MONITORING INSTRUMENT
- ➡ INFERRED GROUNDWATER FLOW DIRECTION
- —1265— WATER TABLE CONTOUR
- —— x —— FENCE LINE
- BUILDING

R9 BCB 11/17/06

WATER TABLE CONTOUR MAP
SEPTEMBER 19, 2006
PLYMOUTH COUNTY LANDFILL
PLYMOUTH COUNTY, IOWA

Project Mngr: RMB	Terracon		Project No. 40905033
Designed By: RMB			Scale: AS SHOWN
Drawn By: LWT	2211 South 156th Circle Omaha, NE 68130		File No. 0E033R51
Checked By: RMB			Date: NOVEMBER 2006
Approved By: DMS		Figure No.	6

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Appendix B

SAMPLE LOCATION NO. *MW-17* *(Up-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE													
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-17 Standard Deviation	MW-17 Mean	10/4/1997	11/10/1997	1/8/1998	4/22/1998	7/1/1998	10/19/1998	4/30/1999	9/1/1999	4/12/2000	10/17/2000	4/25/2001	10/23/2001	4/28/2002	10/6/2002
Laboratory Parameters																		
Chloride (mg/l)	4.823	0.634	1.047	2.729	-	**2.5**	**2.5**	**2.5**	7.3	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**
Chemical Oxygen Demand (mg/l)	8.202	0.000	2.389	3.424	-	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	11
Ammonia Nitrogen (mg/l)	0.100	0.100	0.000	0.100	-	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.000	0.050	-	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Benzene (µg/l)	0.25	0.25	0.000	0.250	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
1,2-Dichloroethane (µg/l)	0.40	0.05	0.088	0.227	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**
1,1-Dichloroethene (µg/l)	1.00	1.00	0.000	1.000	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	-	**1.0**	**1.0**	-	-	-	**1.0**	**1.0**
1,1,1-Trichloroethane (ug/l)	1.23	0.00	0.313	0.604	-	**0.5**	**0.5**	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene (µg/l)	0.50	0.50	0.000	0.500	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Phenols, Total (mg/l)	0.010	0.010	0.000	0.010	-	-	-	-	-	**0.01**	-	**0.01**	-	**0.01**	-	**0.01**	**0.01**	**0.01**
Total Organic Halogens (mg/l)	0.005	0.005	0.000	0.005	-	-	-	-	-	**0.005**	-	**0.005**	-	**0.005**	-	**0.005**	**0.005**	**0.005**
Field Parameters																		
pH	8.1	6.0	0.537	7.049	-	-	-	7.0	7.0	6.8	6.8	6.8	7	5.1	7.5	7.5	6.9	7.4
Specific Conductance (µs/cm)	793	183	152.493	488.000	-	-	-	408	450	444	449	449	465	440	511	473	427	417

NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the Quantitative Limit for parameters not detected.
3) One-half of the Quantitative Limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the Quantitative Limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-17 (Up-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE							
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-17 Standard Deviation	MW-17 Mean	4/3/2003	10/7/2003	4/30/2004	10/12/2004	4/26/2005	10/11/2005	4/26/2006	10/5/2006
Laboratory Parameters												
Chloride (mg/l)	4.823	0.634	1.047	2.729	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**
Chemical Oxygen Demand (mg/l)	8.202	0.000	2.389	3.424	7.5	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	8.4
Ammonia Nitrogen (mg/l)	0.100	0.100	0.000	0.100	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.000	0.050	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Benzene (µg/l)	0.25	0.25	0.000	0.250	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
1,2-Dichloroethane (µg/l)	0.40	0.05	0.088	0.227	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.20**	**0.50**	**0.50**
1,1-Dichloroethene (µg/l)	1.00	1.00	0.000	1.000	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
1,1,1-Trichloroethane (ug/l)	1.23	0.00	0.313	0.604	-	**0.5**	1.44	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Trichloroethene (µg/l)	0.50	0.50	0.000	0.500	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Phenols, Total (mg/l)	0.010	0.010	0.000	0.010	**0.01**	-	**0.01**	-	**0.01**	-	-	-
Total Organic Halogens (mg/l)	0.005	0.005	0.000	0.005	**0.005**	-	**0.005**	-	**0.005**	-	-	-
Field Parameters												
pH	8.1	6.0	0.54	7.0	7.3	7.6	6.9	7.2	7.2	7.37	7.21	7.35
Specific Conductance (µs/cm)	793	183	152.5	488	299	572	525	861	131	699	632	620

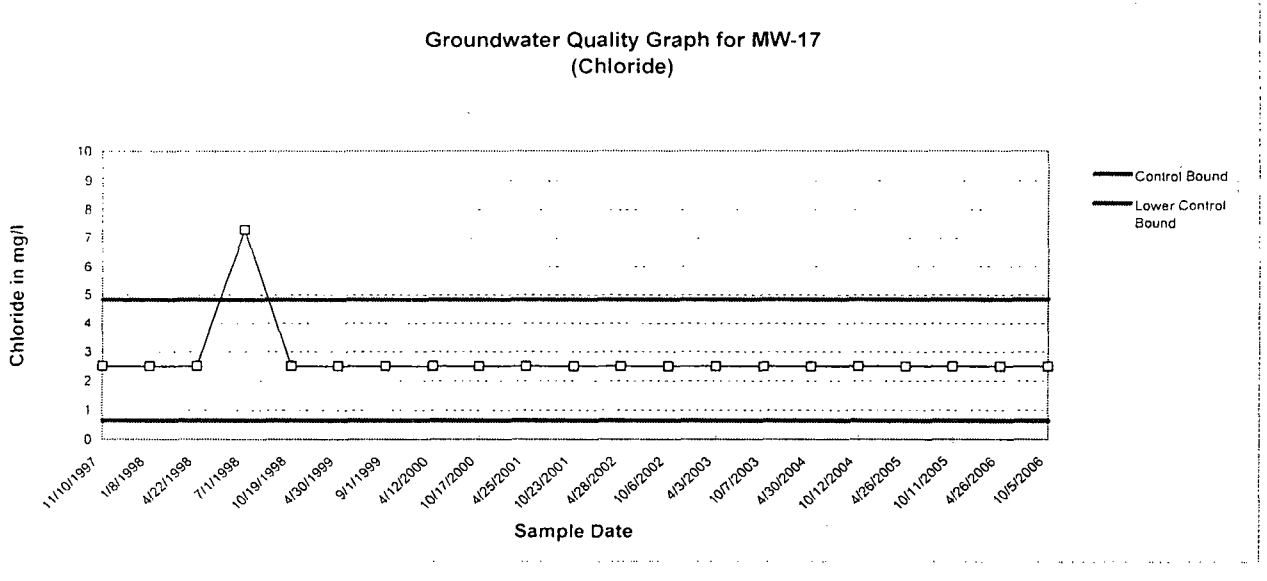
NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the Quantitative Limit (QL) for parameters not detected.
3) One-half of the Quantitative Limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the QL was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



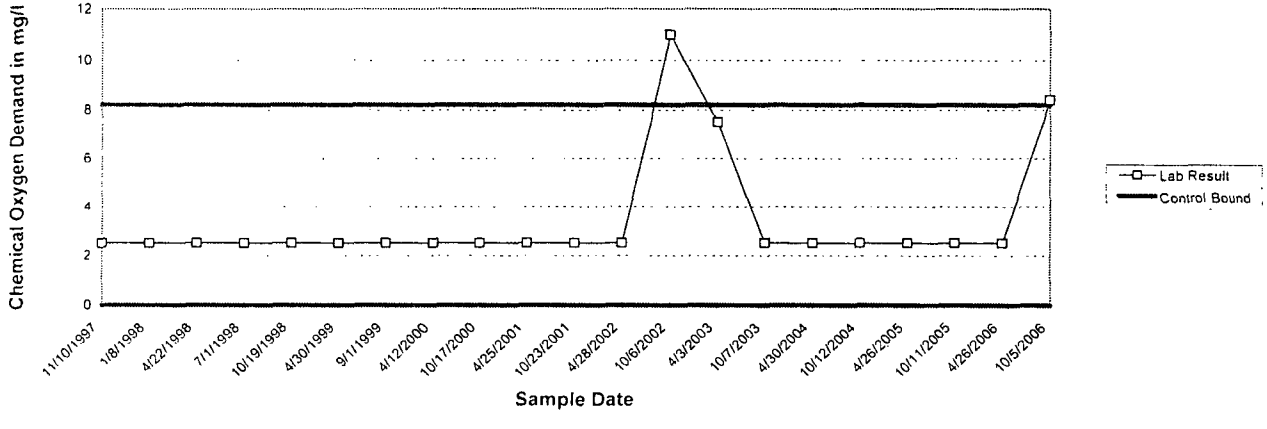
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-17
(Chemical Oxygen Demand)

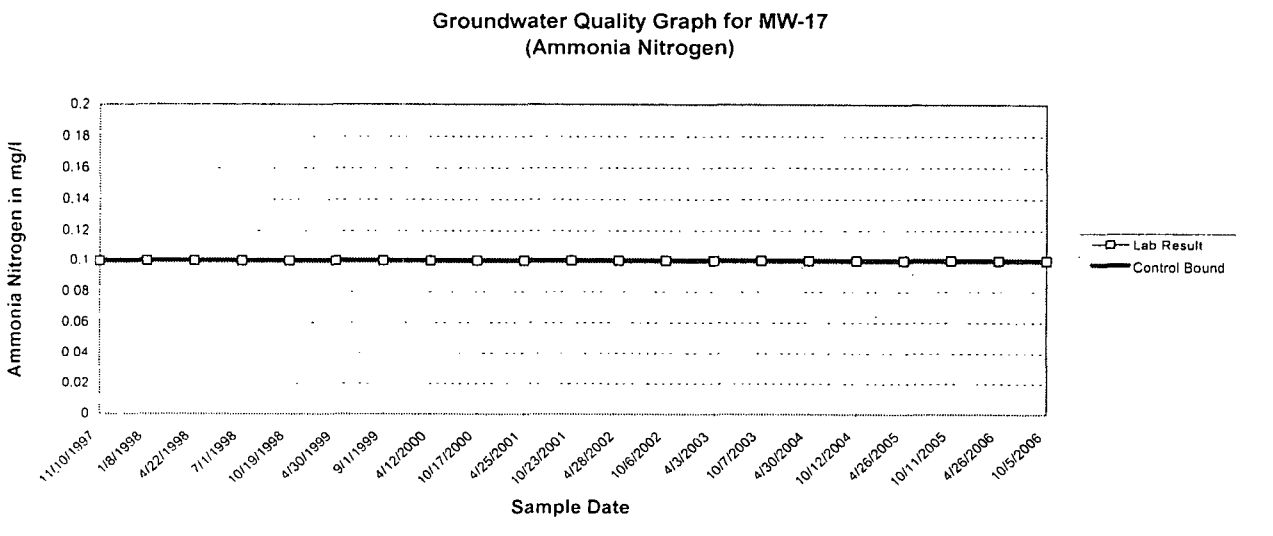


NOTE.
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

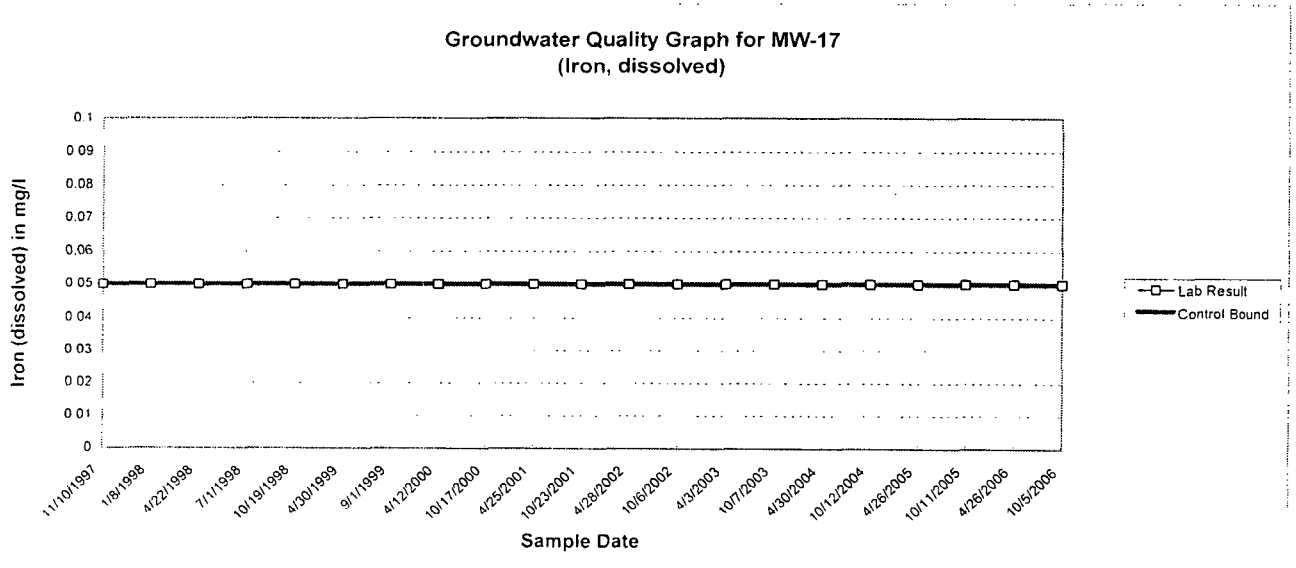


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

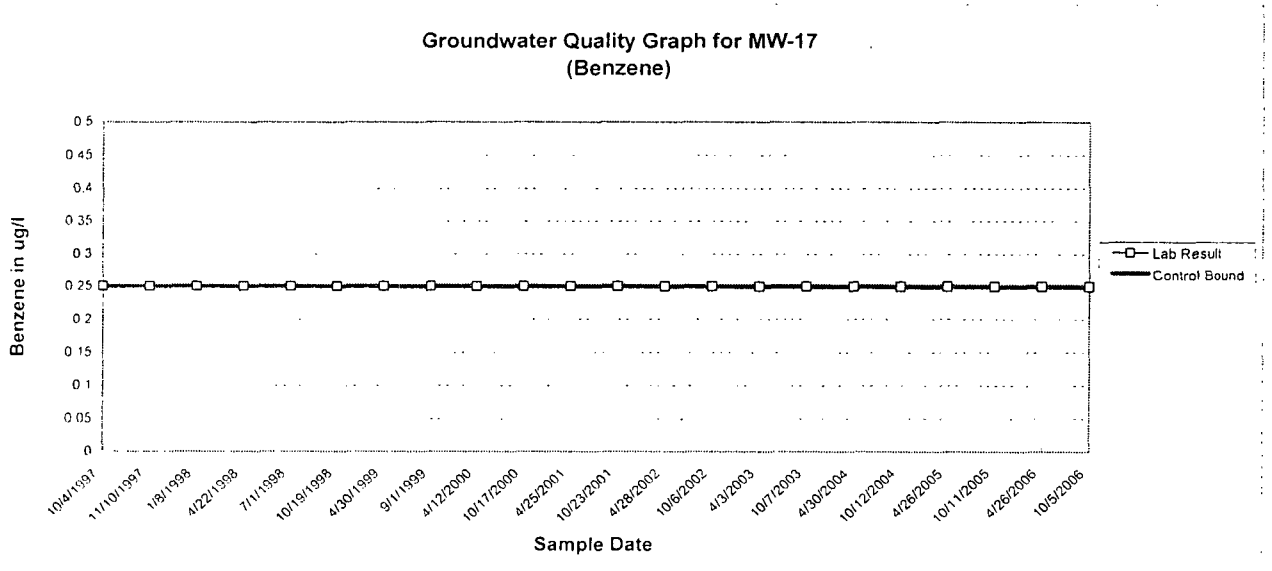


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

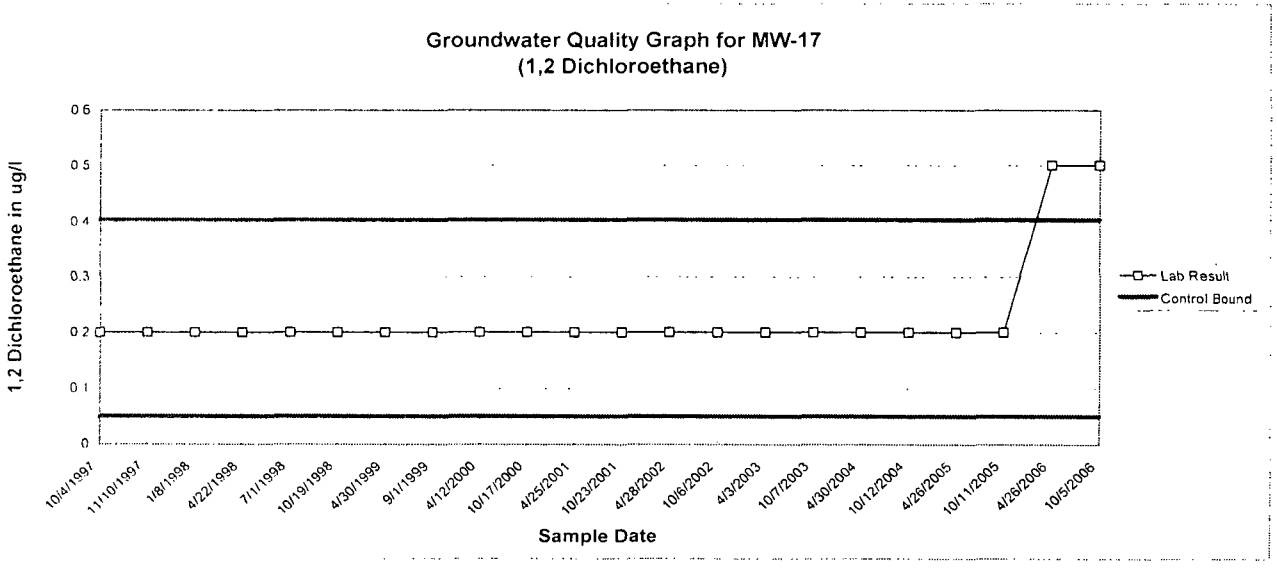


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

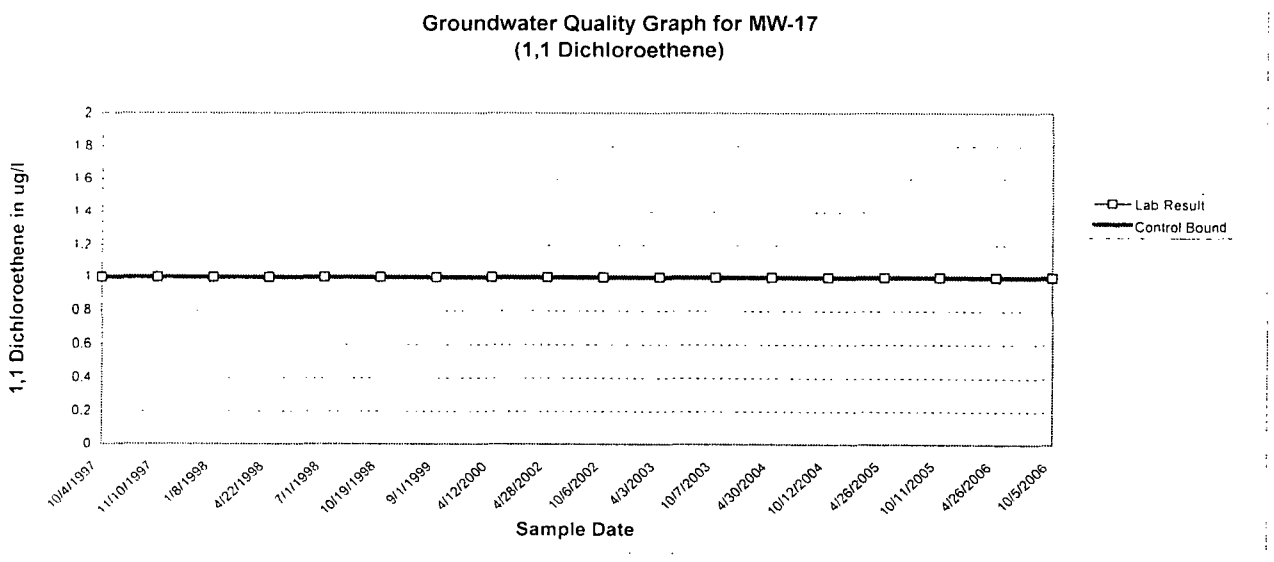


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

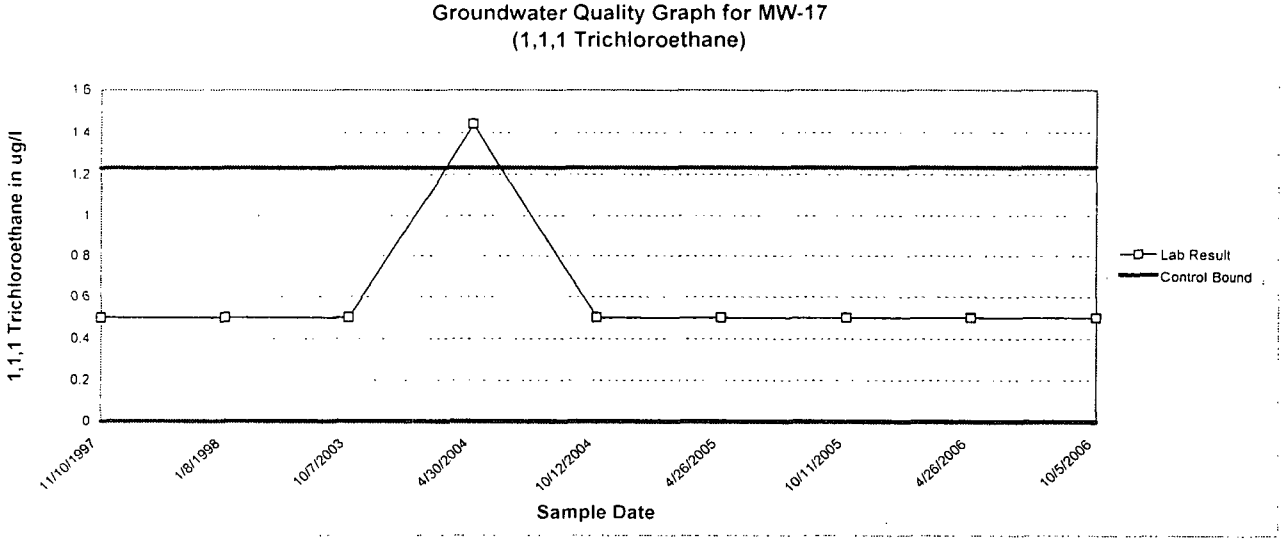


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

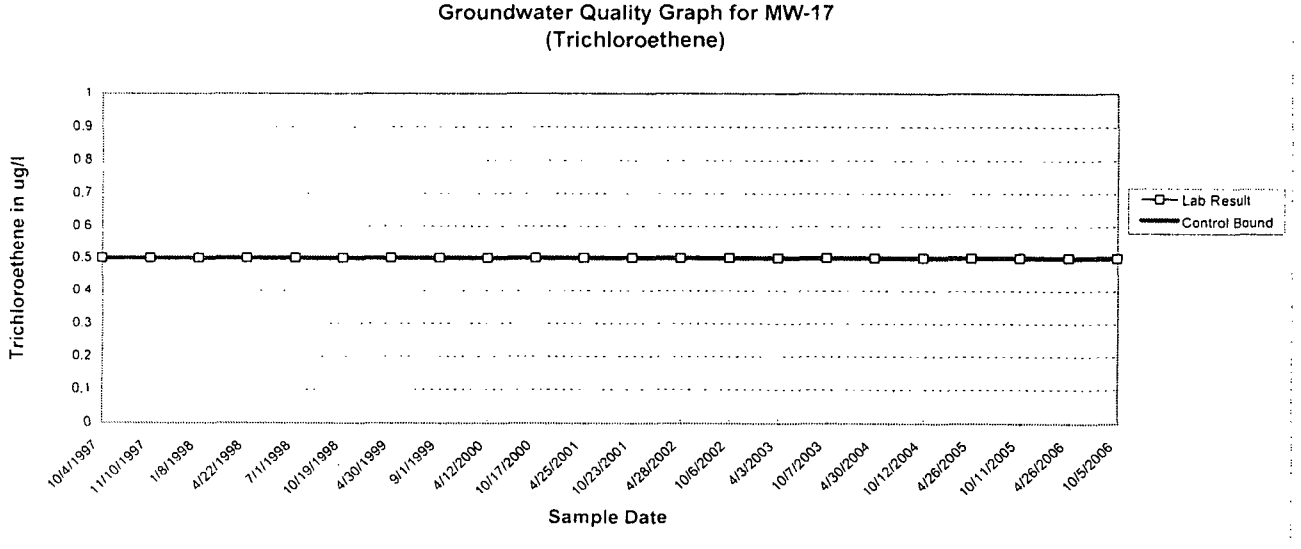


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

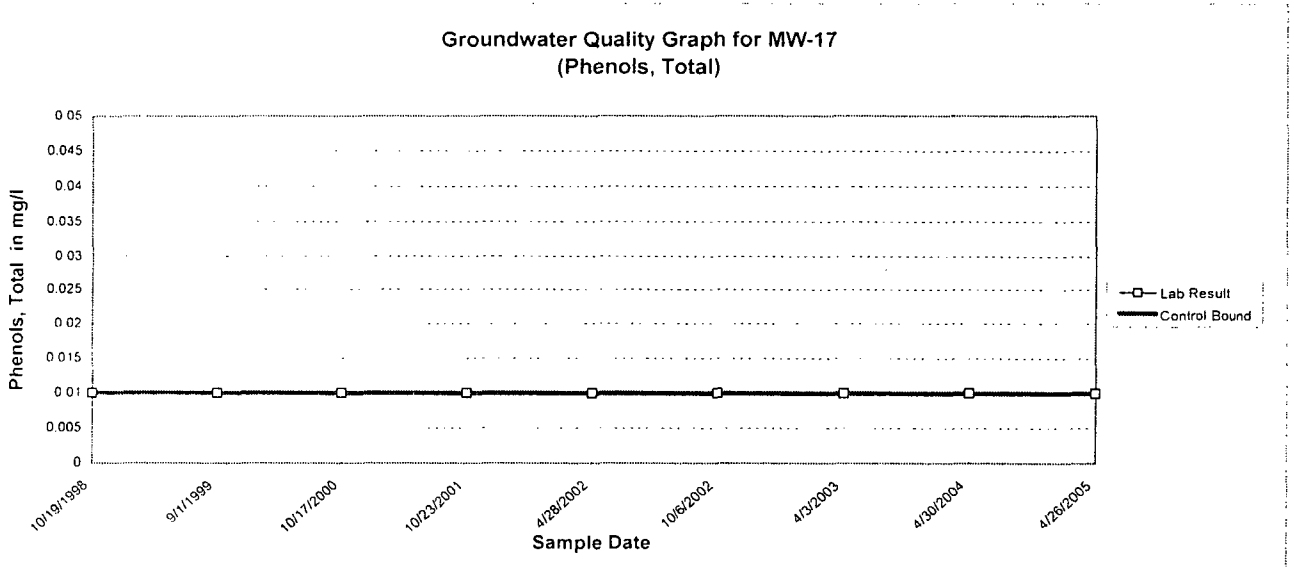


NOTE.
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

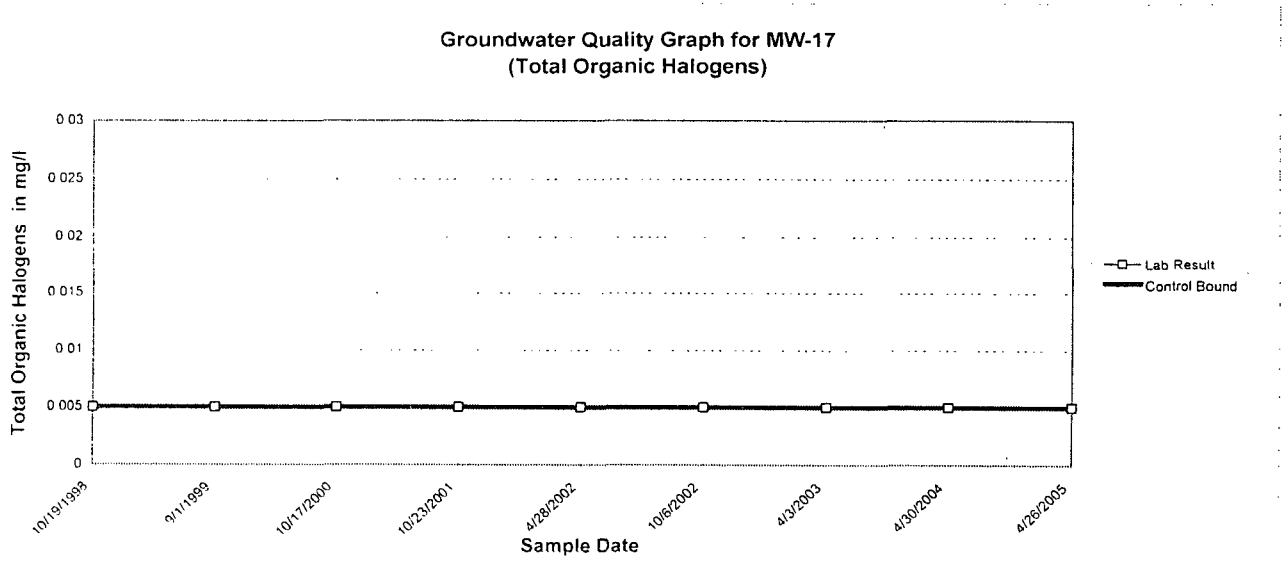


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

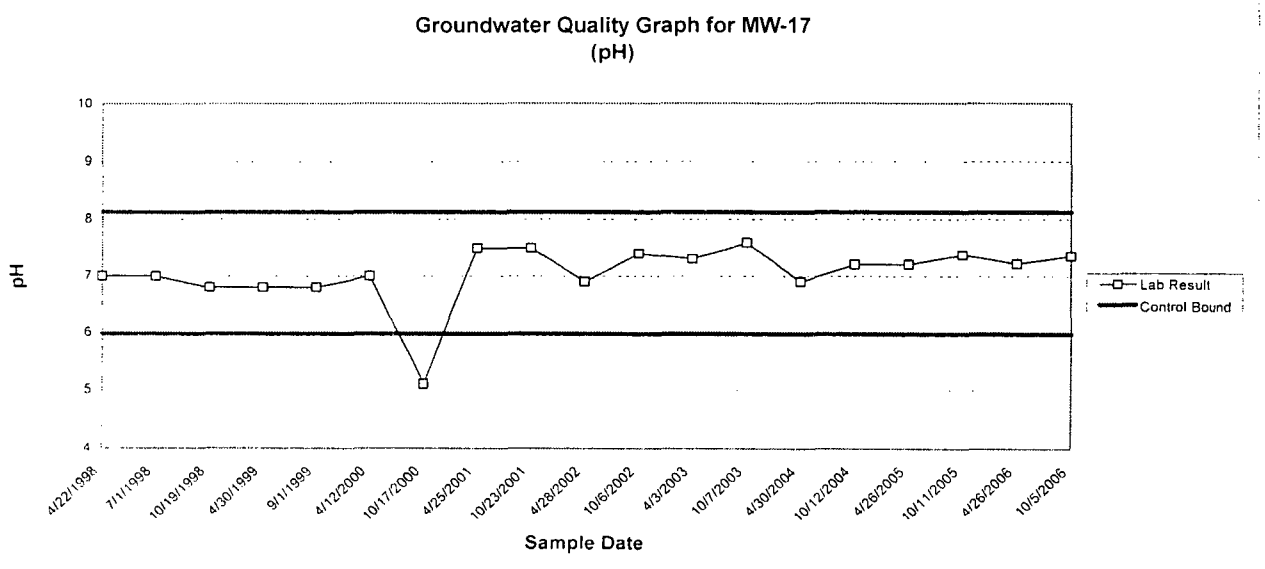


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

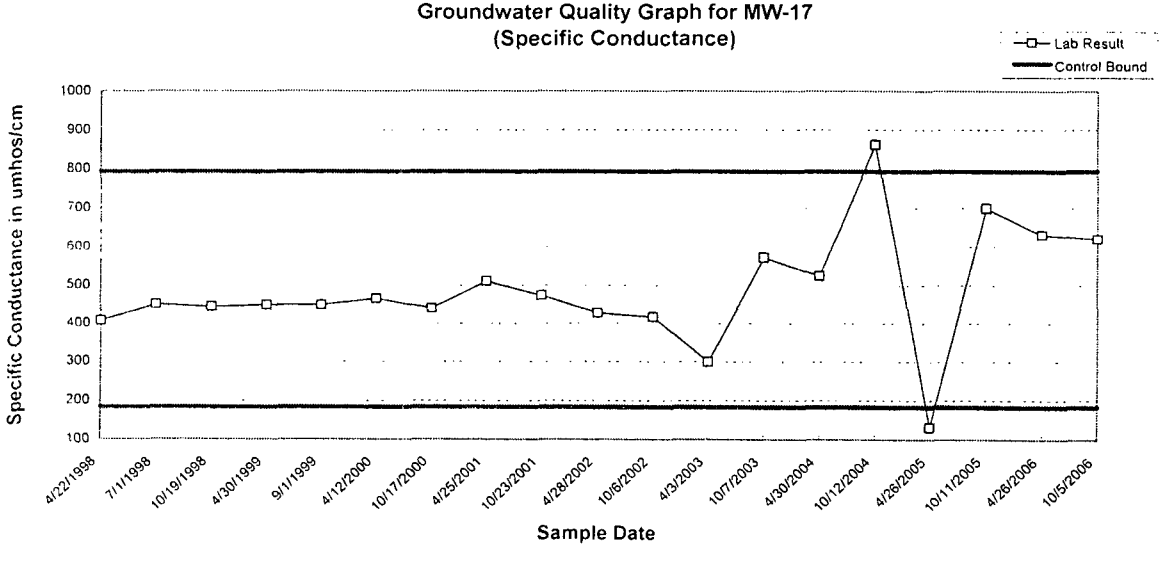


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-17

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-18

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-18* *(Up-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE						
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-18 Standard Deviation	MW-18 Mean	10/11/2005	4/25/2006	10/5/2006				
Laboratory Parameters											
Chloride (mg/l)	4.823	0.634			-	-	-				
Chemical Oxygen Demand (mg/l)	8.202	0.000			-	-	-				
Ammonia Nitrogen (mg/l)	0.100	0.100			-	-	-				
Iron, dissolved (mg/l)	0.050	0.050			-	-	-				
Benzene (µg/l)	0.250	0.250	0.000	0.250	**0.25**	**0.25**	**0.25**				
1,2-Dichloroethane (µg/l)	0.404	0.051	0.173	0.400	**0.2**	**0.5**	**0.5**				
1,1-Dichloroethene (µg/l)	1.000	1.000	0.520	0.700	**0.1**	**1.0**	**1.0**				
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.000	0.500	**0.5**	**0.5**	**0.5**				
Trichloroethene (µg/l)	0.500	0.500	0.000	0.500	**0.5**	**0.5**	**0.5**				
Phenols, Total (mg/l)	0.010	0.010			-	-	-				
Total Organic Halogens (mg/l)	0.005	0.005			-	-	-				
Field Parameters											
pH	8.1	6.0	0.118	7.463	7.4	7.6	7.4				
Specific Conductance (µs/cm)	793	183	279.429	917.667	1240	769	744				

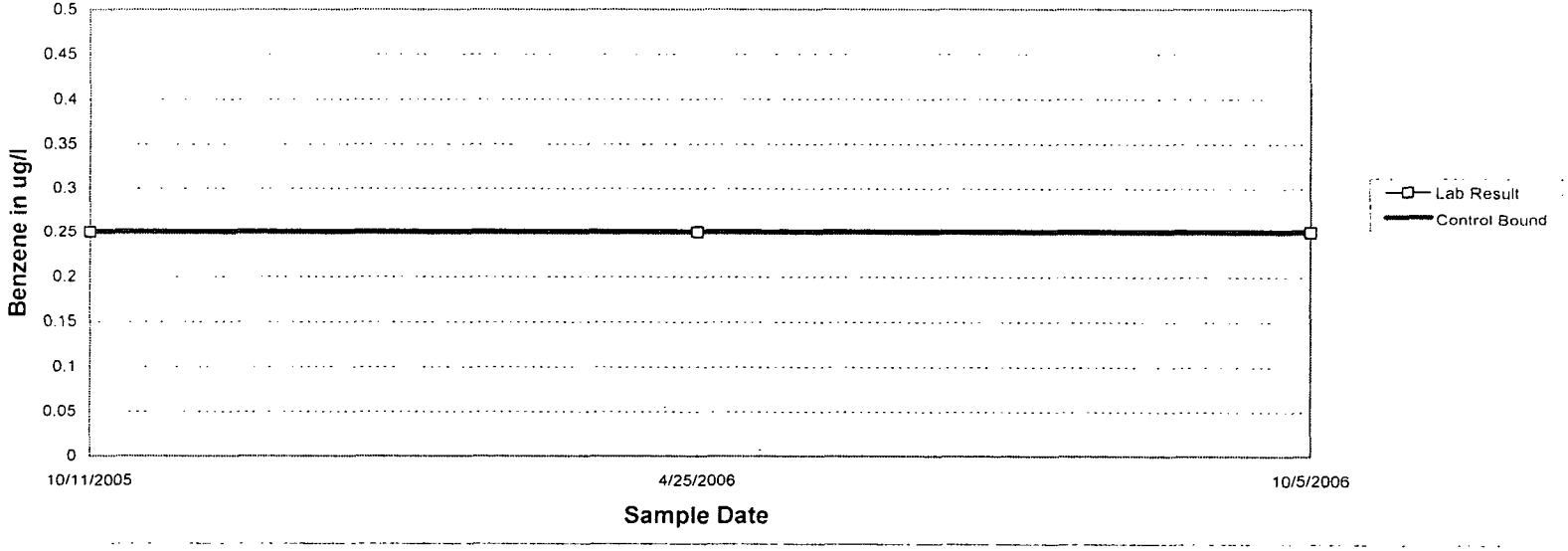
NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the Quantitative Limit for parameters not detected.
3) One-half of the Quantitative Limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the Quantitative Limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-18

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

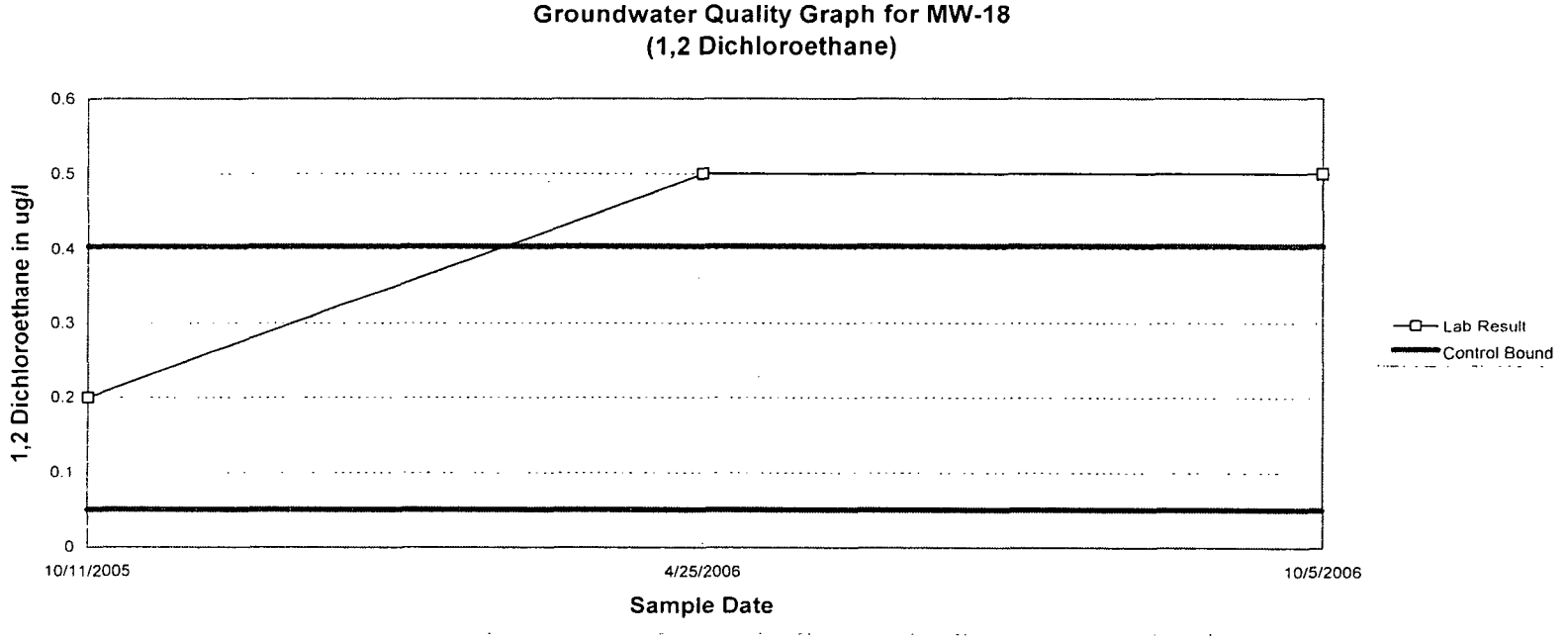


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-18

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



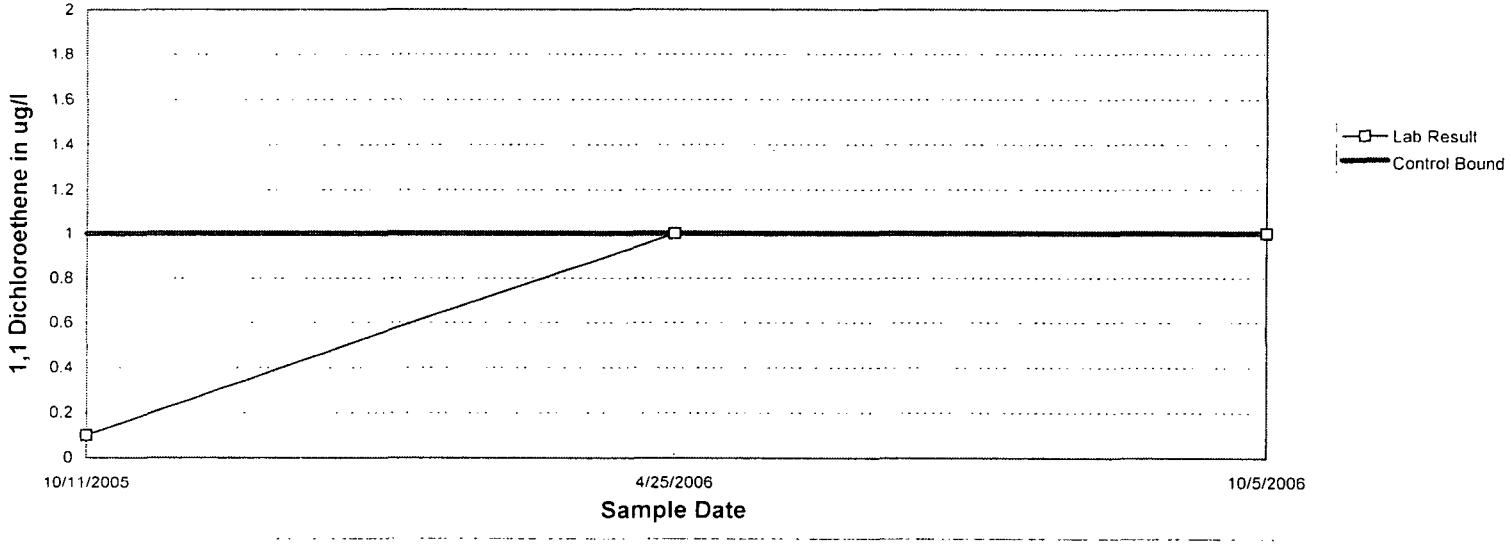
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-18

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-18
(1,1 Dichloroethene)

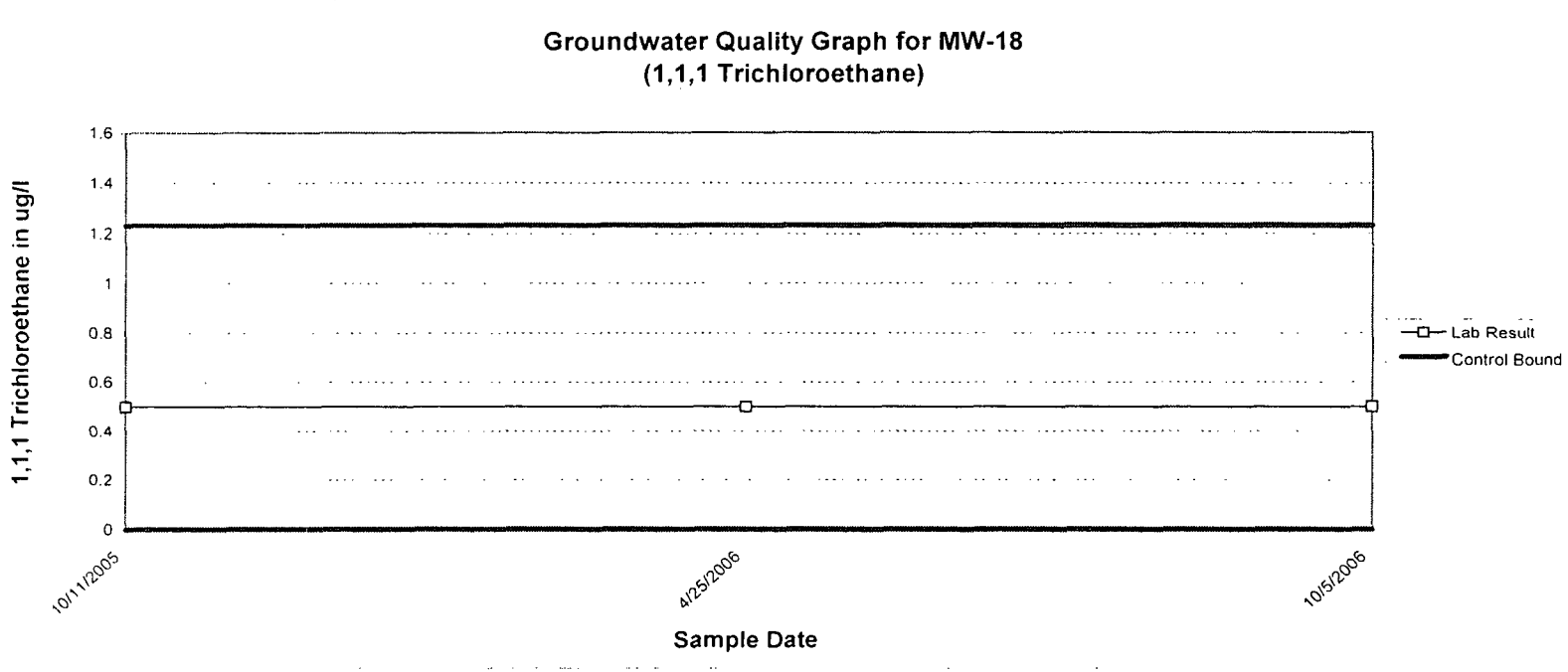


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-18

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



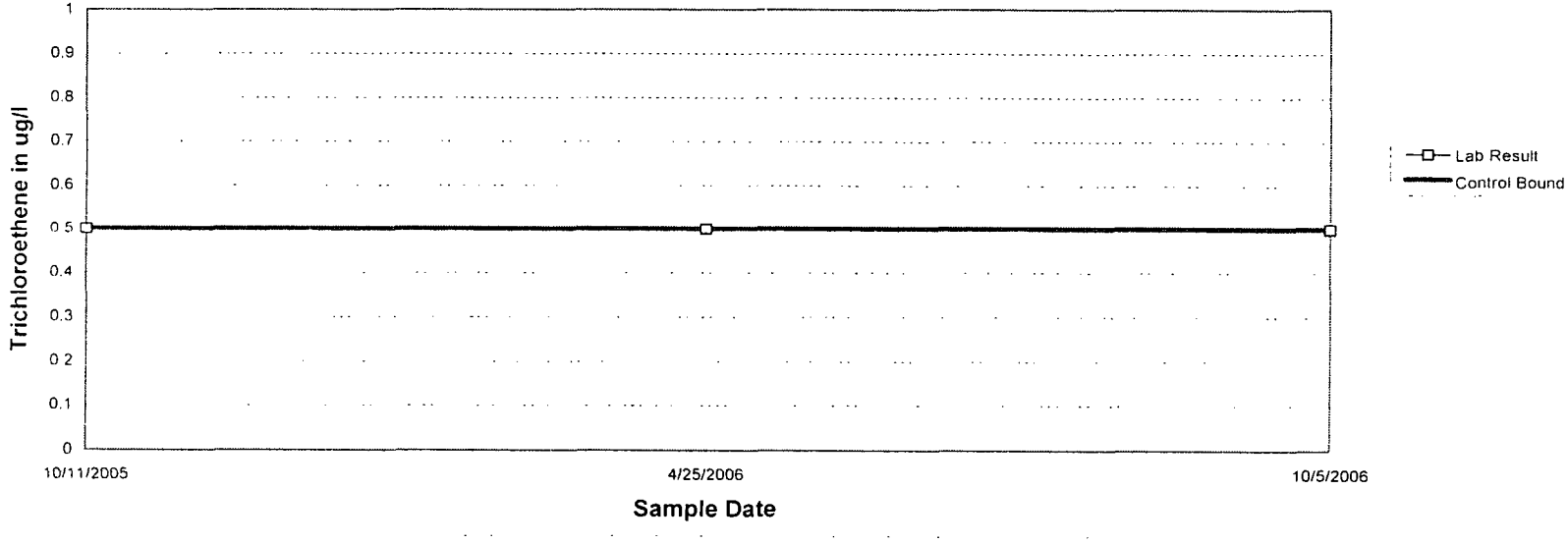
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-18

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-18
(Trichloroethene)

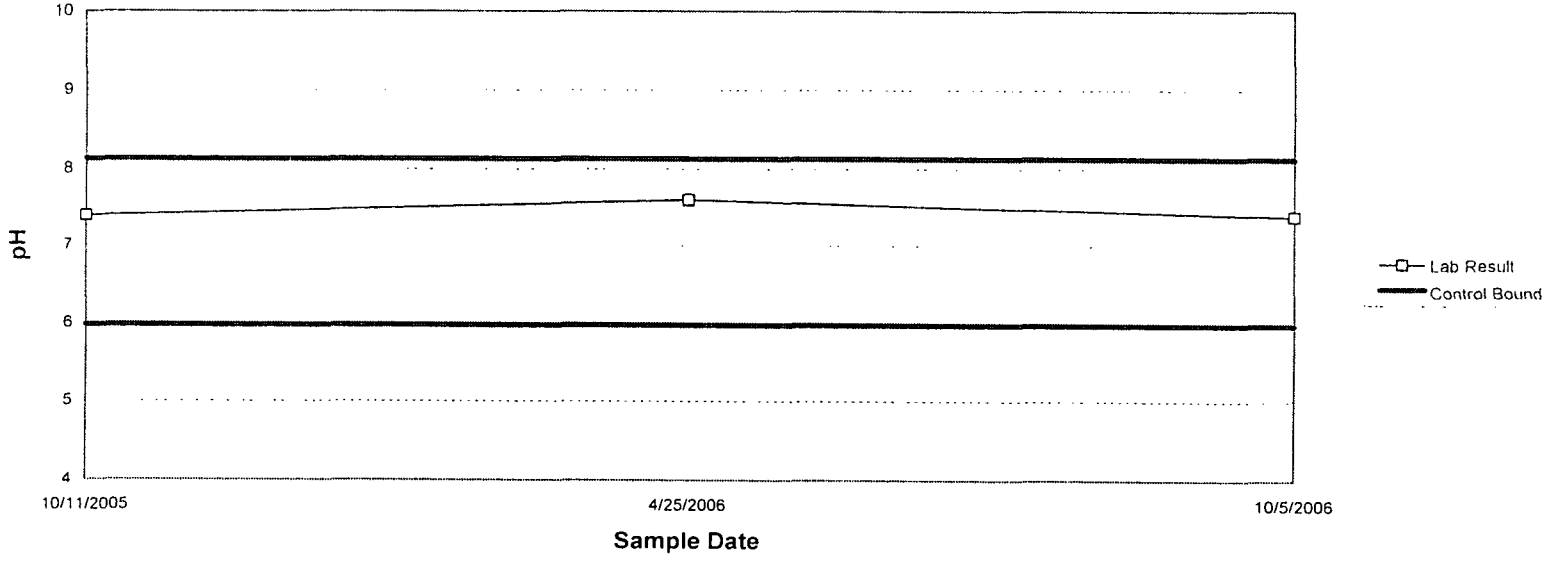


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-18

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

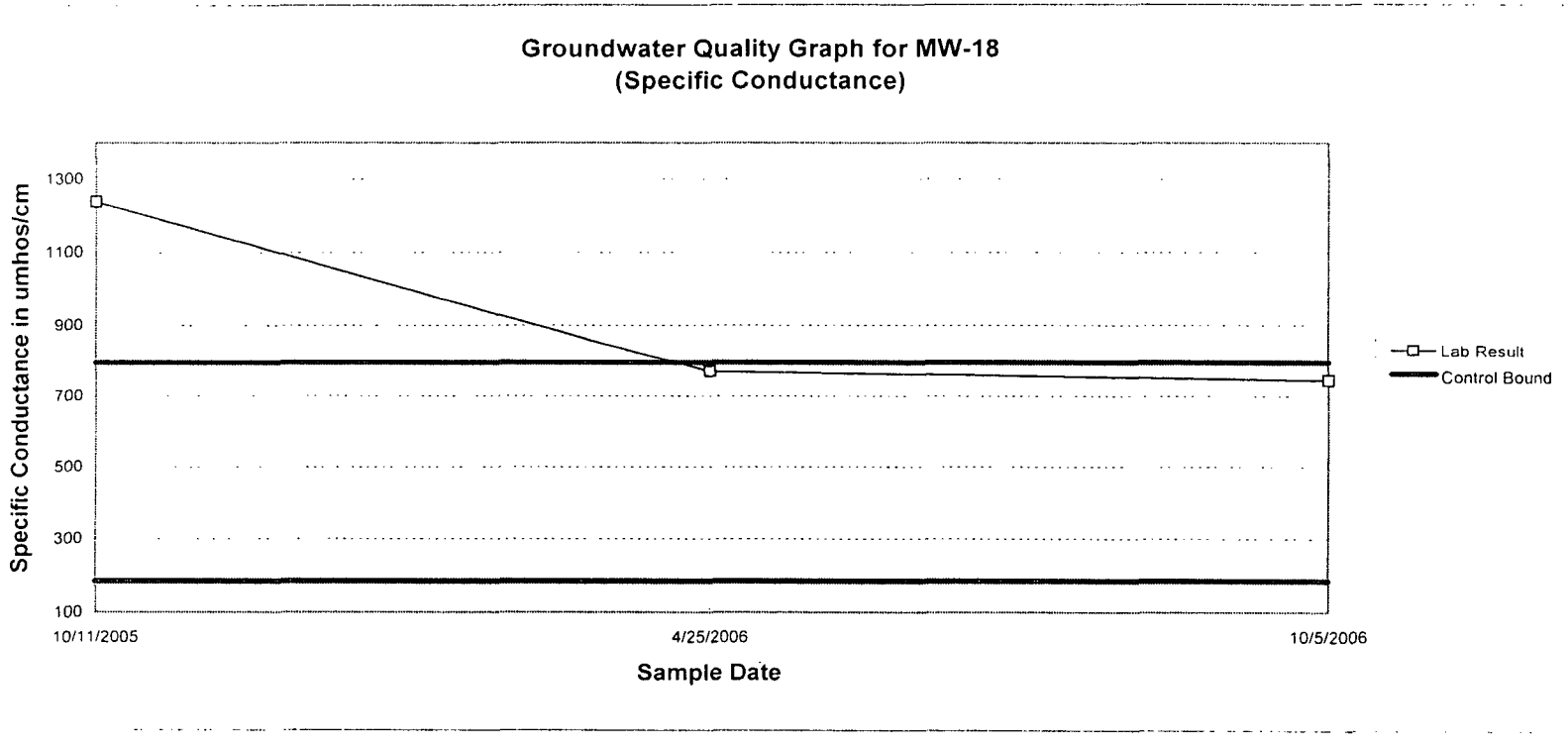


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-18

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-16

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-16 (Up-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE								
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-16 Standard Deviation	MW-16 Mean	10/4/1997	4/22/1998	10/19/1998	4/30/1999	9/1/1999	4/12/2000	10/17/2000	4/25/2001	10/23/2001
Laboratory Parameters													
Chloride (mg/l)	4.823	0.634	1.955	4.667	-	-	-	-	-	-	-	5.2	**2.5**
Chemical Oxygen Demand (mg/l)	8.202	0.000	0.000	2.500	-	-	-	-	-	-	-	**2.5**	**2.5**
Ammonia Nitrogen (mg/l)	0.100	0.100	0.000	0.100	-	-	-	-	-	-	-	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.000	0.050	-	-	-	-	-	-	-	**0.05**	**0.05**
Benzene (µg/l)	0.250	0.250	0.000	0.250	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
1,2-Dichloroethane (µg/l)	0.404	0.051	0.095	0.232	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**
1,1-Dichloroethene (µg/l)	1.000	1.000	0.000	1.000	**1.0**	**1.0**	**1.0**	-	**1.0**	**1.0**	-	-	-
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.000	0.500	-	-	-	-	-	-	-	-	-
Trichloroethene (µg/l)	0.500	0.500	0.138	0.532	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Phenols, Total (mg/l)	0.010	0.010	0.000	0.010	-	-	-	-	-	-	**0.01**	-	**0.01**
Total Organic Halogens (mg/l)	0.005	0.005	0.000	0.005	-	-	-	-	-	-	**0.005**	-	**0.005**
Field Parameters													
pH	8.1	6.0	0.4	7.0	-	6.9	6.7	6.5	6.1	6.3	6.7	7.4	7.3
Specific Conductance (µs/cm)	793	183	154	497	-	448	473	500	546	445	346	409	487

NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the Quantitative Limit for parameters not detected.
3) One-half of the Quantitative Limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the Quantitative Limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-16

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-16 (Up-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE									
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-16 Standard Deviation	MW-16 Mean	4/28/2002	10/6/2002	4/3/2003	10/7/2003	4/30/2004	10/12/2004	4/26/2005	10/11/2005	4/26/2006	10/5/2006
Laboratory Parameters														
Chloride (mg/l)	4.823	0.634	1.955	4.667	-	-	-	6.3	-	-	-	-	-	-
Chemical Oxygen Demand (mg/l)	8.202	0.000	0.000	2.500	-	-	-	**2.5**	-	-	-	-	-	-
Ammonia Nitrogen (mg/l)	0.100	0.100	0.000	0.100	-	-	-	**0.1**	-	-	-	-	-	-
Iron, dissolved (mg/l)	0.050	0.050	0.000	0.050	-	-	-	**0.05**	-	-	-	-	-	-
Benzene (µg/l)	0.250	0.250	0.000	0.250	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
1,2-Dichloroethane (µg/l)	0.404	0.051	0.095	0.232	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.5**	**0.5**
1,1-Dichloroethene (µg/l)	1.000	1.000	0.000	1.000	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
1,1,1-Trichloroethane (ug/l)	1.231	0.000			-	-	-	-	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Trichloroethene (µg/l)	0.500	0.500	0.138	0.532	**0.5**	**0.5**	**0.5**	**0.5**	1.1	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Phenols, Total (mg/l)	0.010	0.010	0.000	0.010	-	-	-	-	-	-	-	-	-	-
Total Organic Halogens (mg/l)	0.005	0.005	0.000	0.005	-	-	-	-	-	-	-	-	-	-
Field Parameters														
pH	8.1	6.0	0.4	7.0	7	7.4	7.3	7.6	6.9	7.3	7.1	7.5	7.36	7.34
Specific Conductance (µs/cm)	793	183	154	497	450	403	466	339	795	659	161	725	657	643

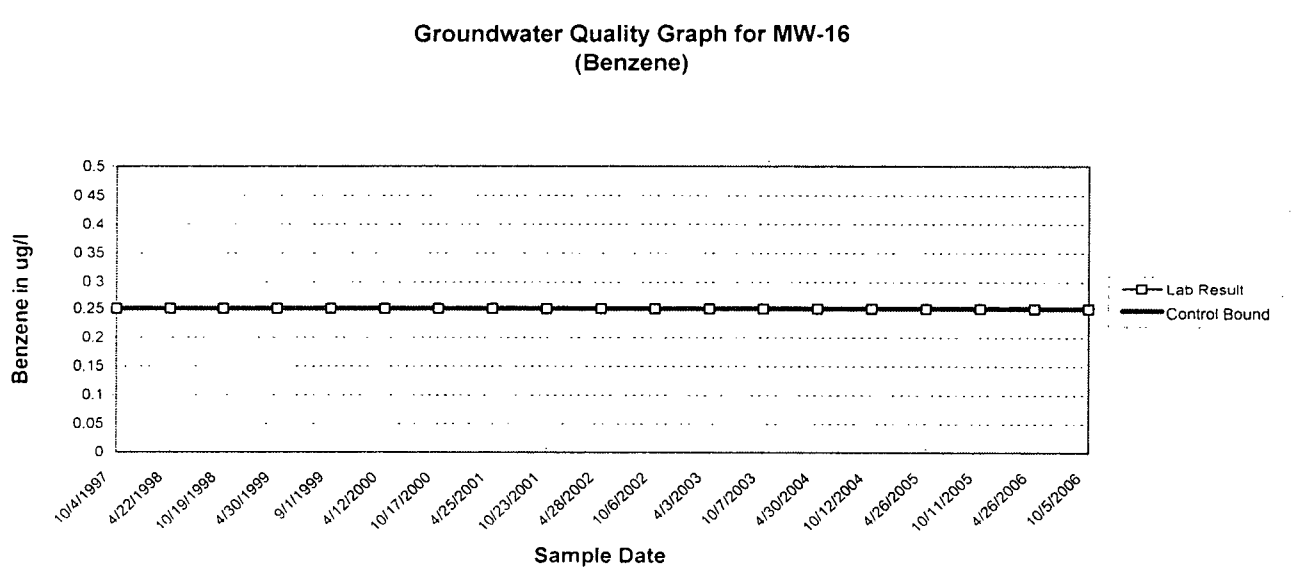
NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the Quantitative Limit for parameters not detected.
3) One-half of the Quantitative Limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the Quantitative Limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-16

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

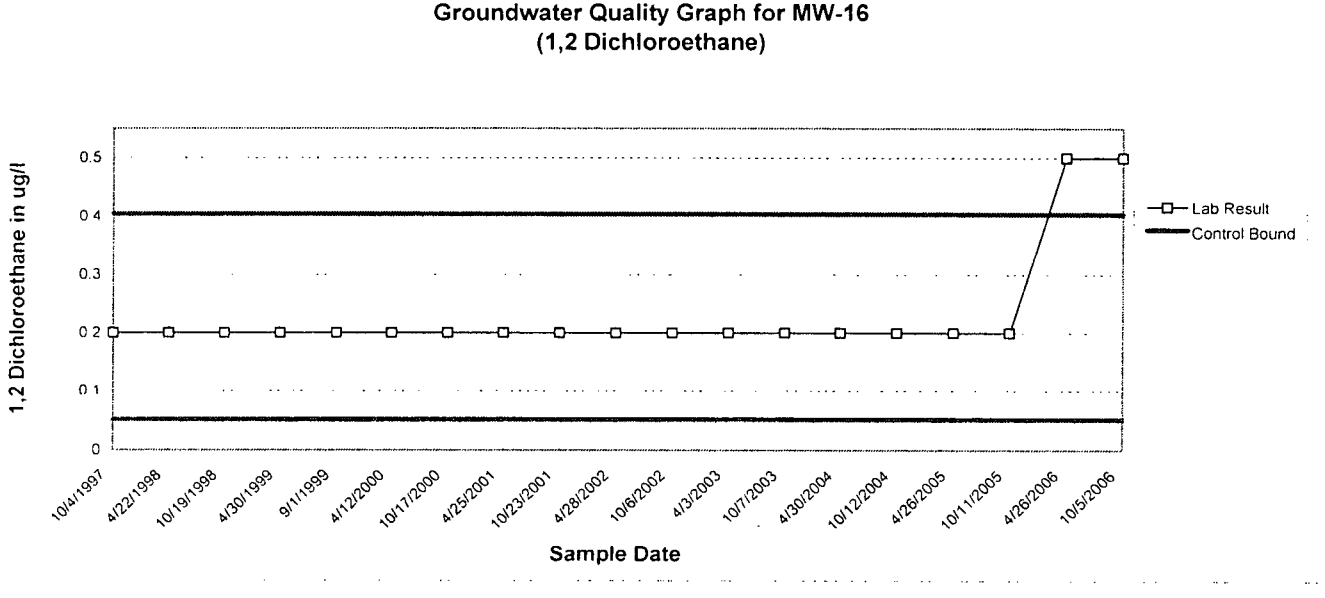


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-16

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

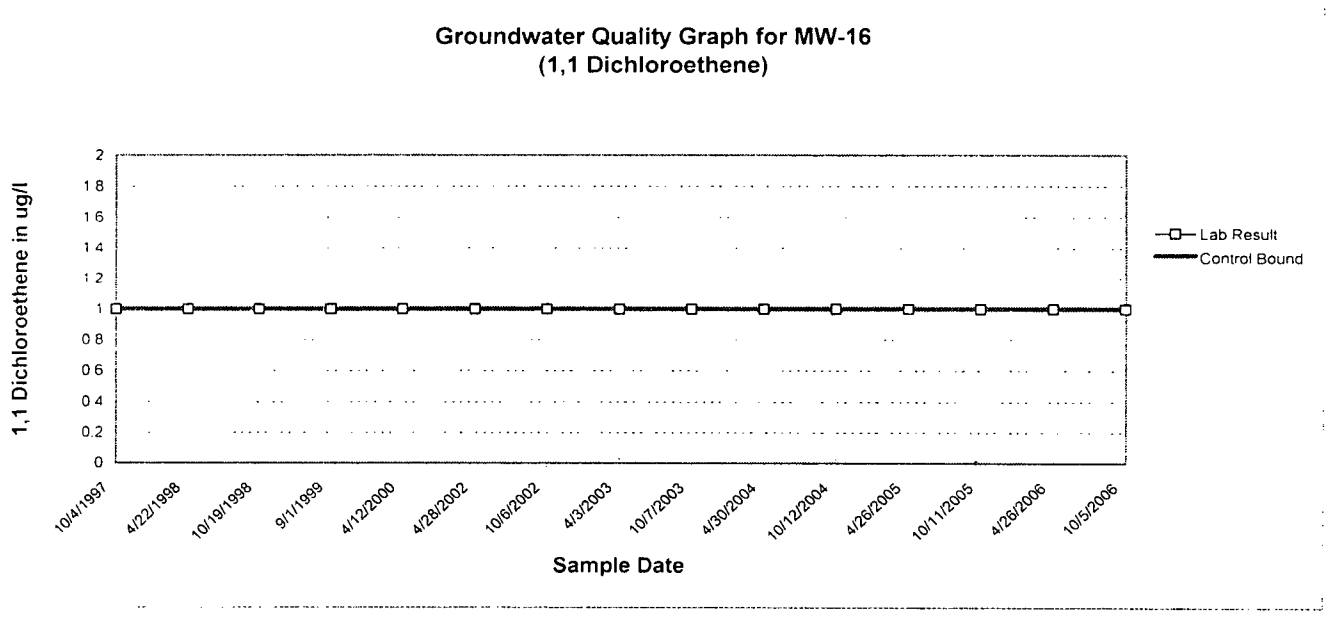


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-16

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

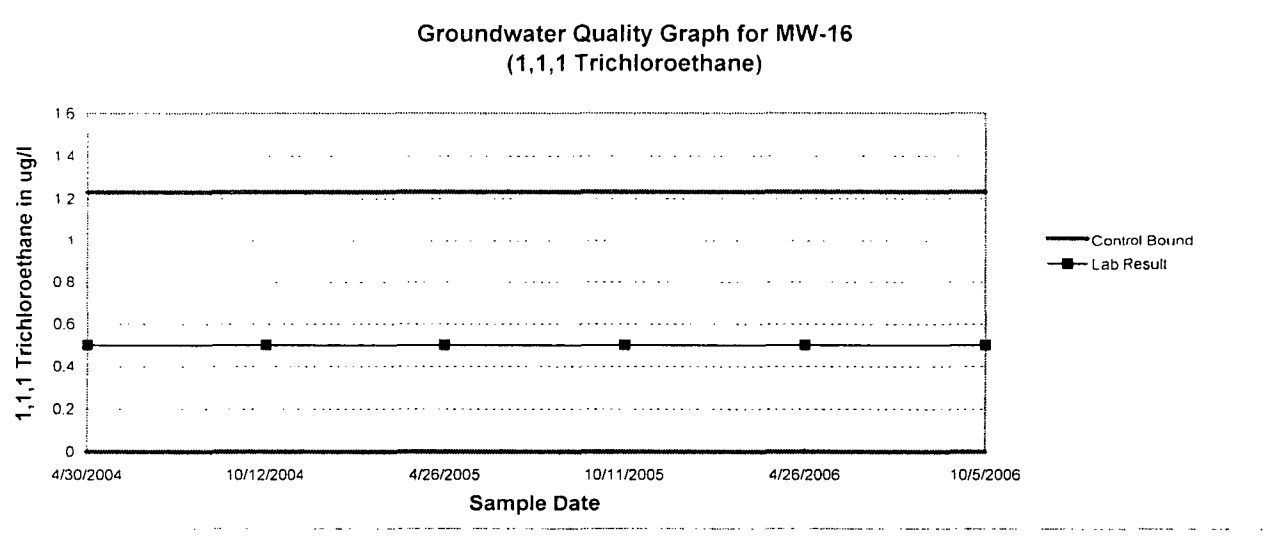


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-16

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

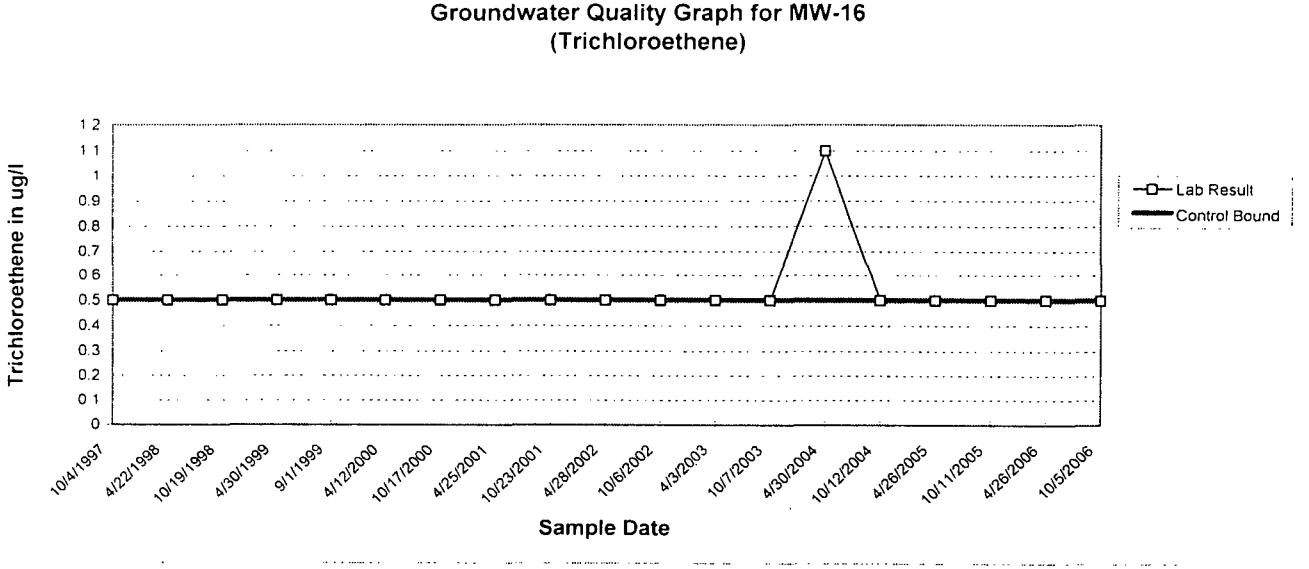


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-16

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



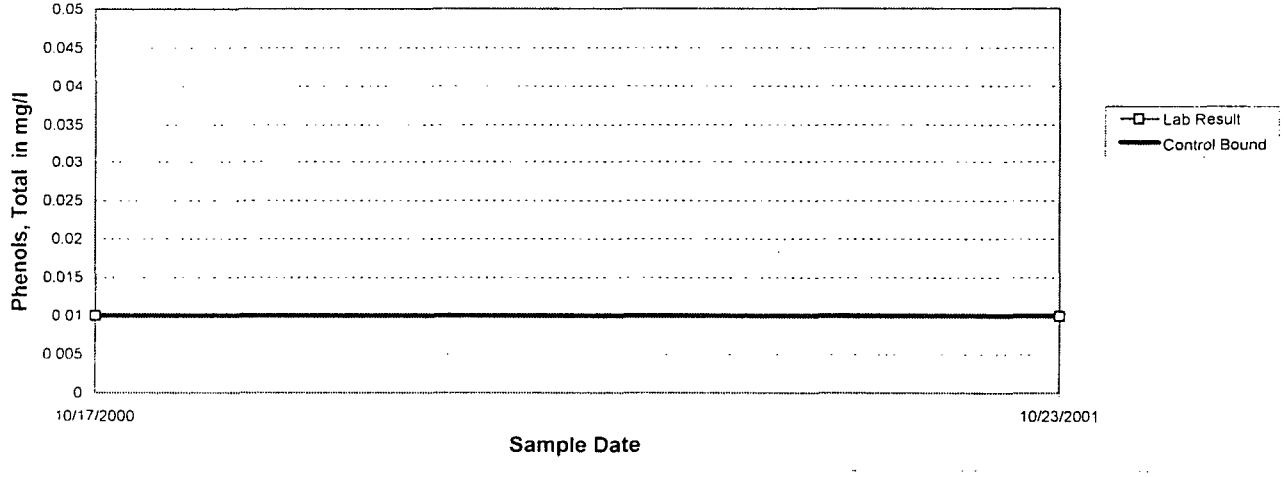
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-16

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-16
(Phenols, Total)

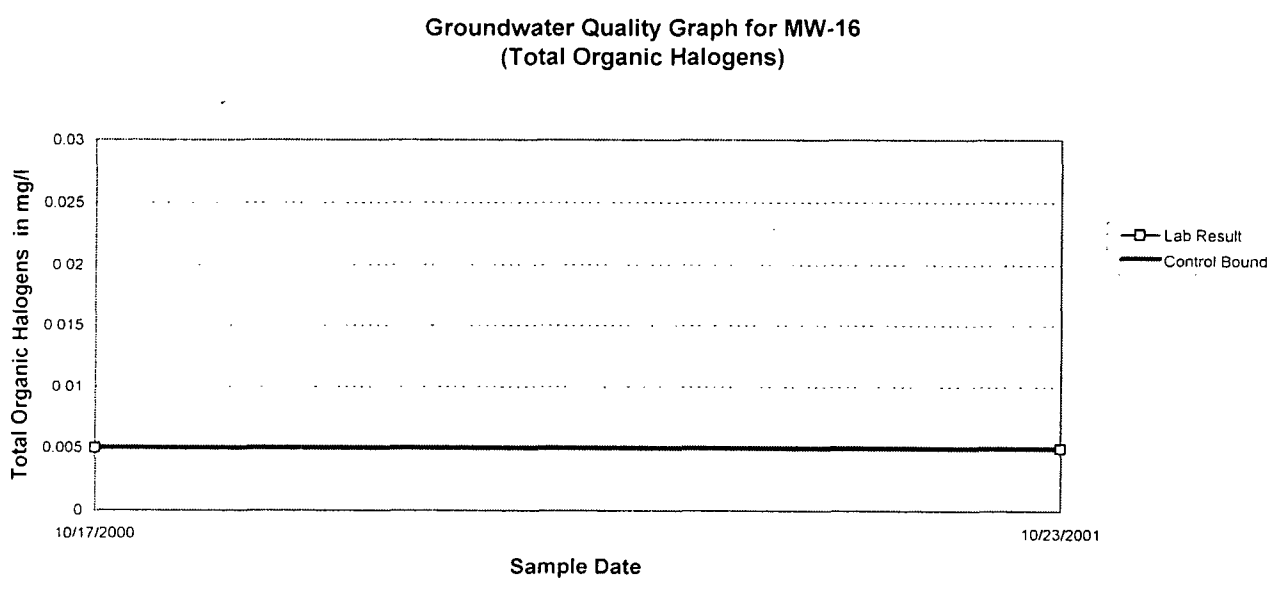


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-16

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

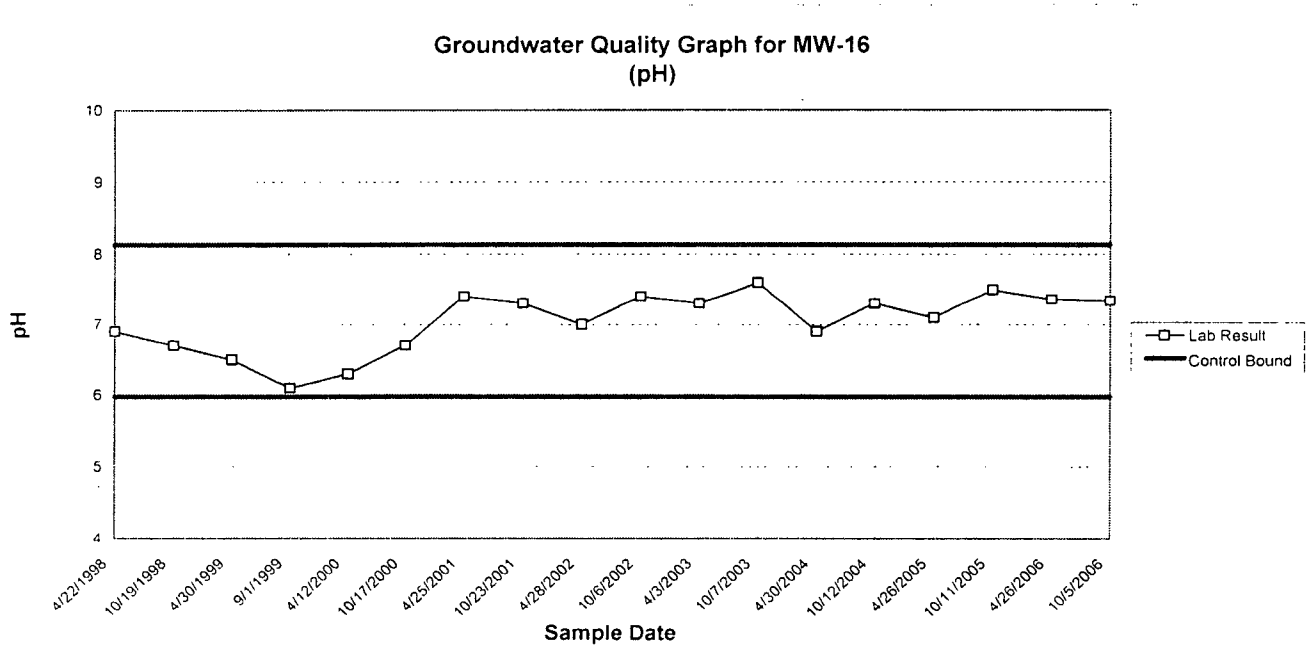


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative Limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-16

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

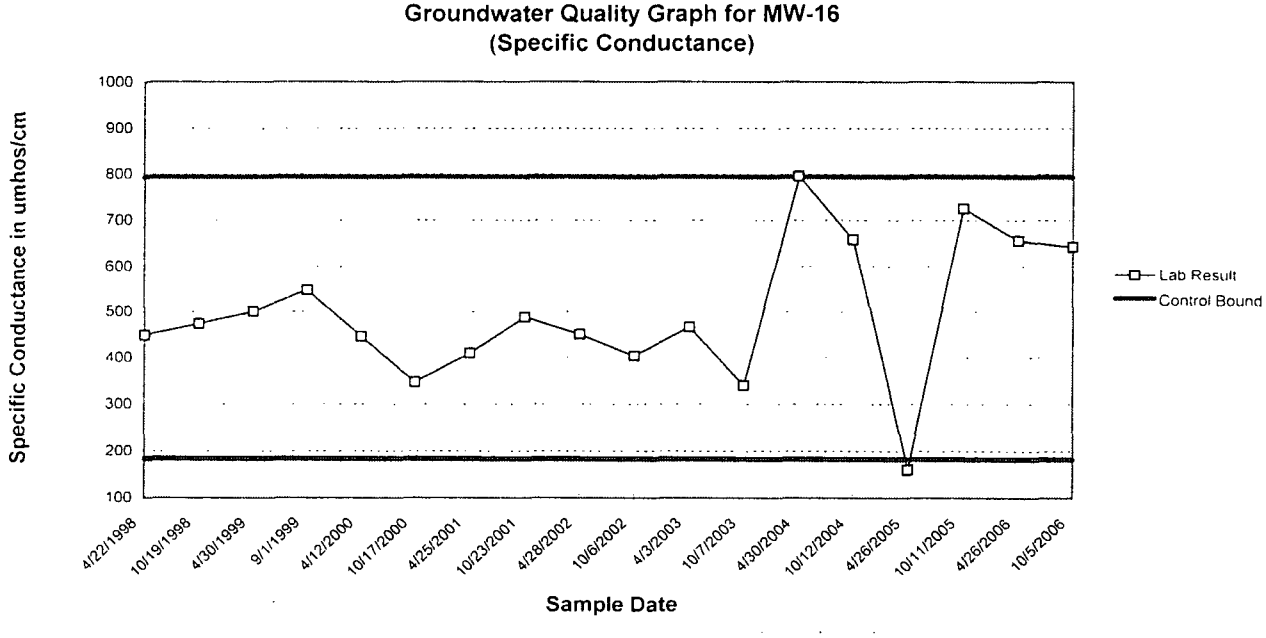


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-16

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-15

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-15 (Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE							
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-15 Standard Deviation	MW-15 Mean	4/3/2003	10/7/2003	4/30/2004	10/12/2004	4/26/2005	10/11/2005	4/26/2006	10/5/2006
Laboratory Parameters											-	-
Chloride (mg/l)	4.823	0.634	0.173	8.500	-	8.6	-	-	-	-	-	-
Chemical Oxygen Demand (mg/l)	8.202	0.000	6.640	6.333	-	**2.5**	-	-	-	-	-	-
Ammonia Nitrogen (mg/l)	0.100	0.100	0.000	0.100	-	**0.1**	-	-	-	-	-	-
Iron, dissolved (mg/l)	0.050	0.050	0.614	0.500	-	**0.25**	-	-	-	-	-	-
Benzene (µg/l)	0.250	0.250	0.000	0.250	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
1,2-Dichloroethane (µg/l)	0.404	0.051	0.095	0.232	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.5**	**0.5**
1,1-Dichloroethene (µg/l)	1.000	1.000	0.000	1.000	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.000	0.500	-	-	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Trichloroethene (µg/l)	0.500	0.500	0.365	1.054	1.5	1.28	**0.5**	1.07	1.15	1.27	1.11	1.12
Phenols, Total (mg/l)	0.010	0.010	0.000	0.010	-	-	-	-	-	-	-	-
Total Organic Halogens (mg/l)	0.005	0.005	0.001	0.022	-	-	-	-	-	-	-	-
Field Parameters												
pH	8.12	5.97	0.3	6.5	6.8	6.5	6.4	6.8	6.5	6.7	6.7	6.8
Specific Conductance (µs/cm)	793.0	183.0	301	984	994	824	1475	167	1297	1398	1224	1322

NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory detection limt (MDL) for parameters not detected.
3) One-half of the quantitation limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the MDL was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-15

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-15 (Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE										
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-15 Standard Deviation	MW-15 Mean	10/4/1997	4/27/1998	10/19/1998	4/30/1999	9/1/1999	4/12/2000	10/17/2000	4/25/2001	10/24/2001	4/28/2002	10/6/2002
Laboratory Parameters															
Chloride (mg/l)	4.823	0.634	0.173	8.500	-	-	-	-	-	-	-	8.3	8.6	-	-
Chemical Oxygen Demand (mg/l)	8.202	0.000	6.640	6.333	-	-	-	-	-	-	-	14	**2.5**	-	-
Ammonia Nitrogen (mg/l)	0.100	0.100	0.000	0.100	-	-	-	-	-	-	-	**0.1**	**0.1**	-	-
Iron, dissolved (mg/l)	0.050	0.050	0.614	0.500	-	-	-	-	-	-	-	1.2	**0.05**	-	-
Benzene (µg/l)	0.250	0.250	0.000	0.250	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
1,2-Dichloroethane (µg/l)	0.404	0.051	0.095	0.232	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**
1,1-Dichloroethene (µg/l)	1.000	1.000	0.000	1.000	**1.0**	**1.0**	**1.0**	-	**1.0**	**1.0**	-	-	-	**1.0**	**1.0**
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.000	0.500	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene (µg/l)	0.500	0.500	0.365	1.054	**0.5**	**0.5**	**0.5**	**0.5**	1.3	1.3	1.1	1.6	1.3	1.3	1.13
Phenols, Total (mg/l)	0.010	0.010	0.000	0.010	-	-	-	-	-	-	**0.01**	-	**0.01**	-	-
Total Organic Halogens (mg/l)	0.005	0.005	0.001	0.022	-	-	-	-	-	-	0.021	-	0.022	-	-
Field Parameters															
pH	8.1	6.0	0.289	6.488	-	6.5	6.5	6.2	6.0	6.0	5.9	6.7	6.7	6.4	6.7
Specific Conductance (µs/cm)	793	183	300.569	984.389	-	824	824	879	1012	925	969	721	1075	903	886

NOTE:

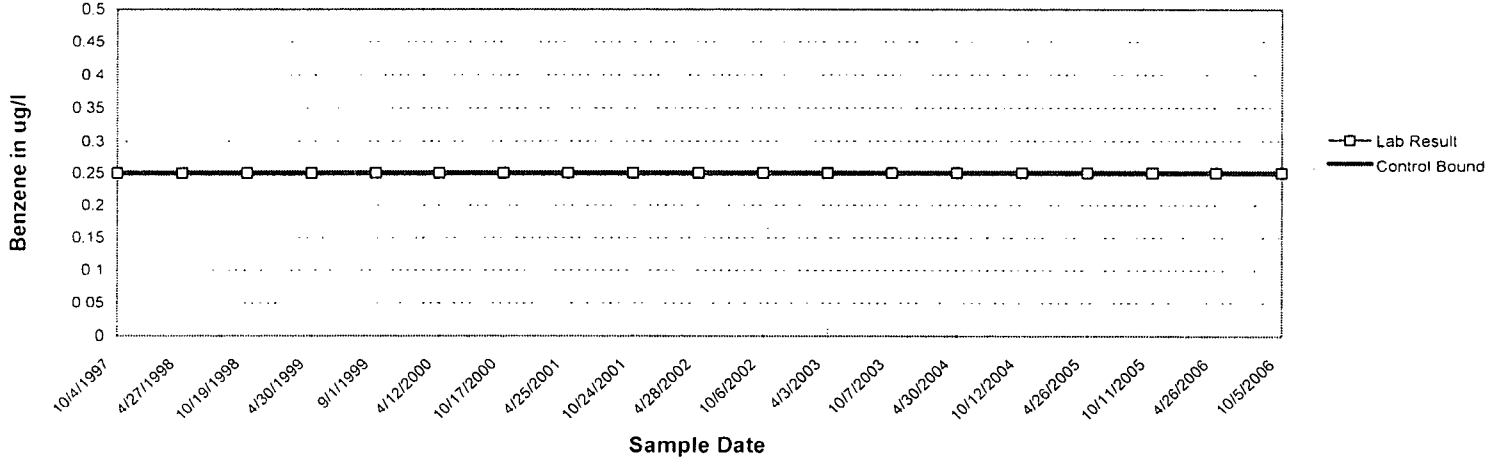
1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory detection limt (MDL) for parameters not detected.
3) One-half of the quantitation limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the MDL was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-15

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-15
(Benzene)



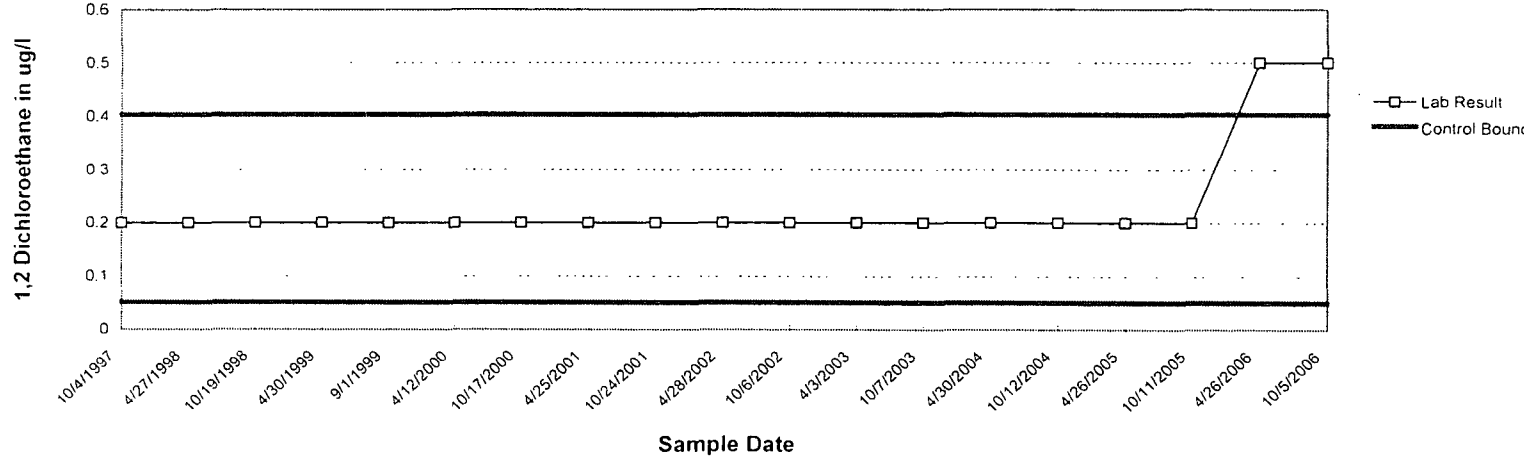
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitation limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-15

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-15
(1,2 Dichloroethane)

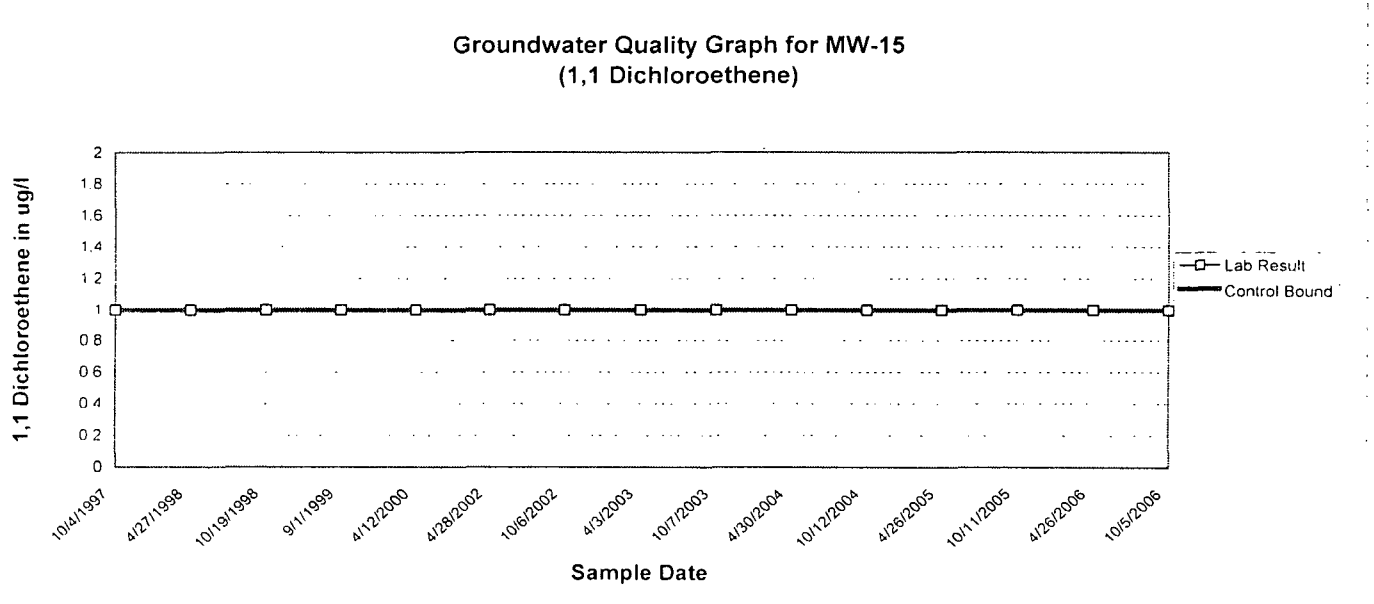


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitation limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-15

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

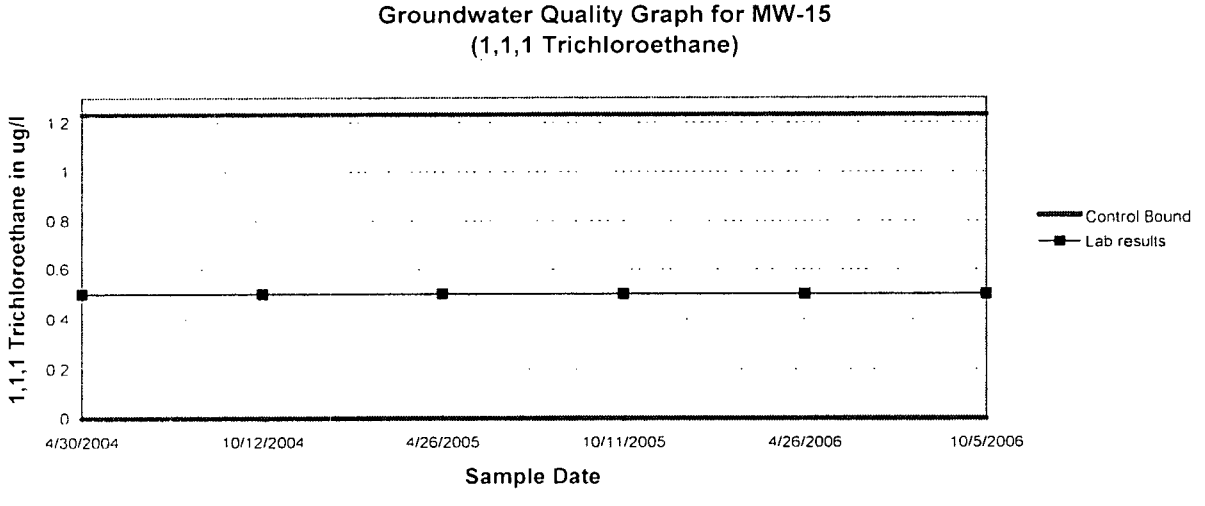


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitation limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-15

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

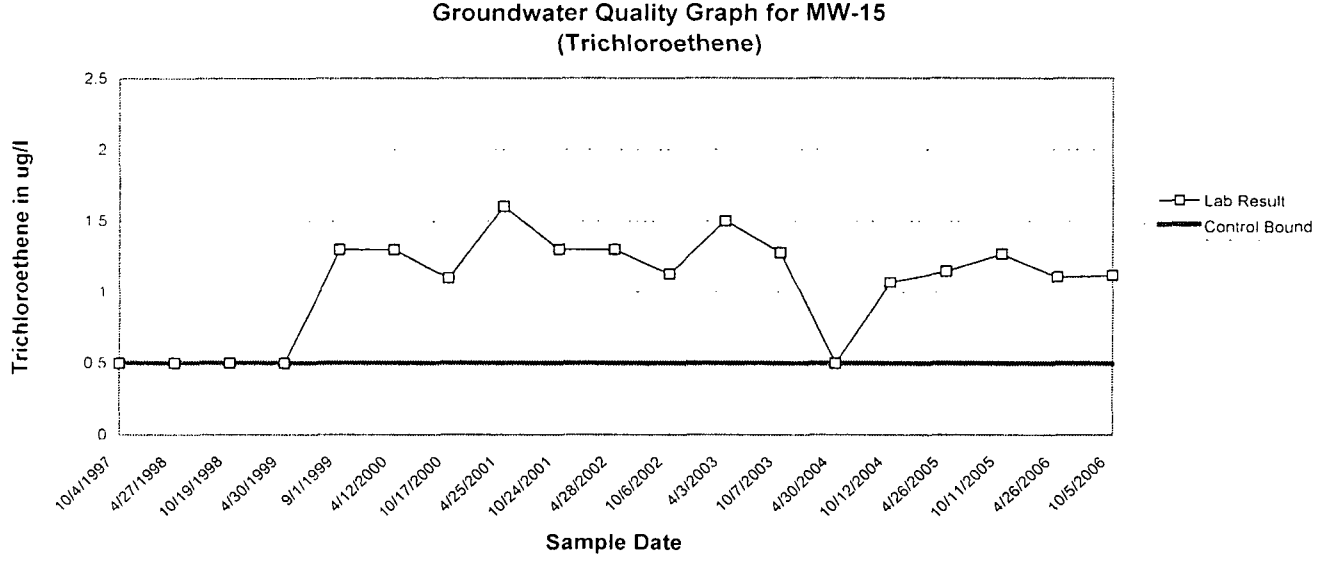


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitation limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-15

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



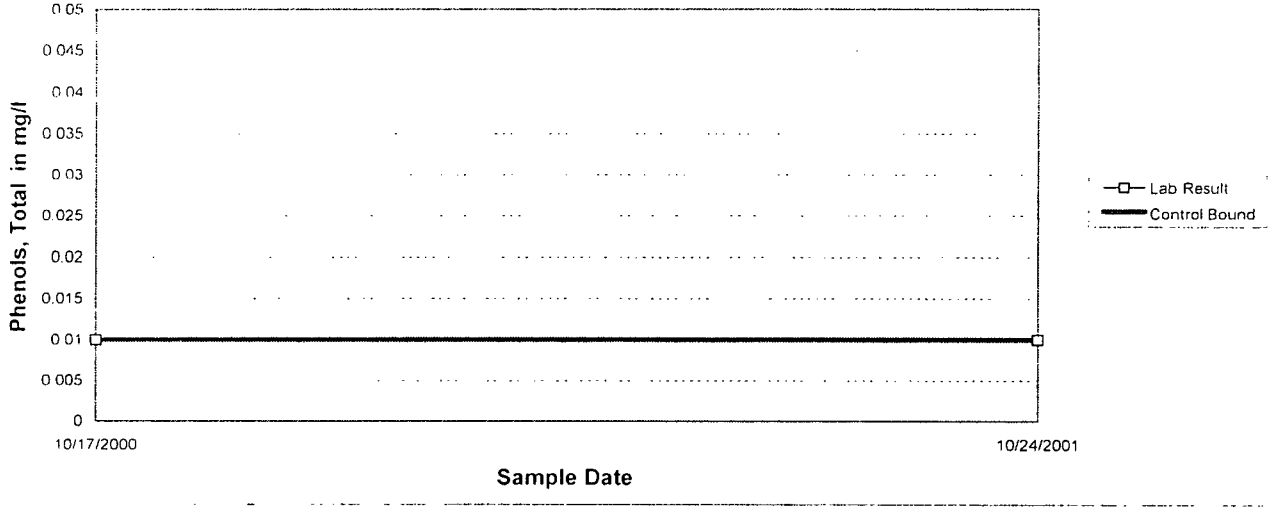
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitation limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-15

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-15
(Phenols, Total)



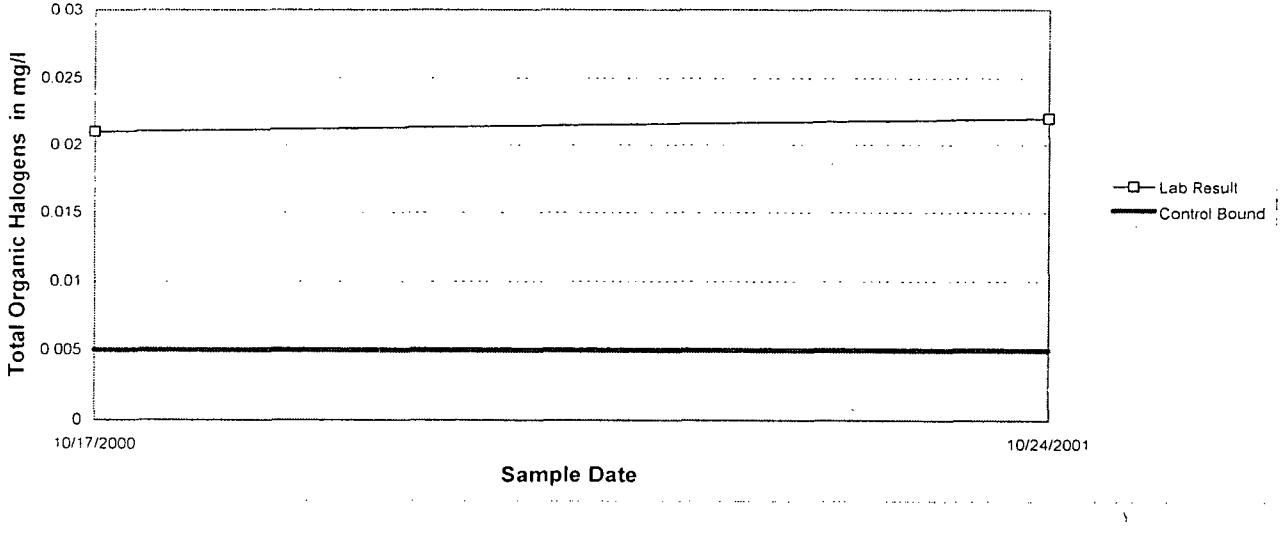
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitation limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-15

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-15
(Total Organic Halogens)

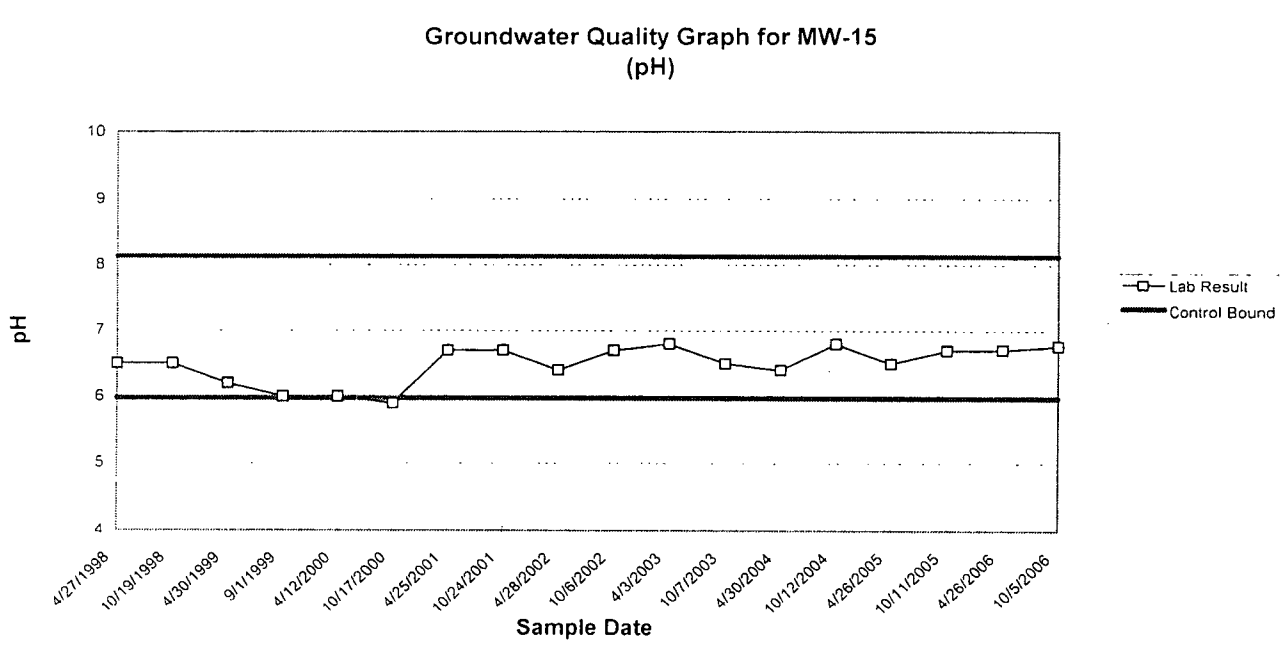


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).

ANALYSIS SHEET MW-15

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

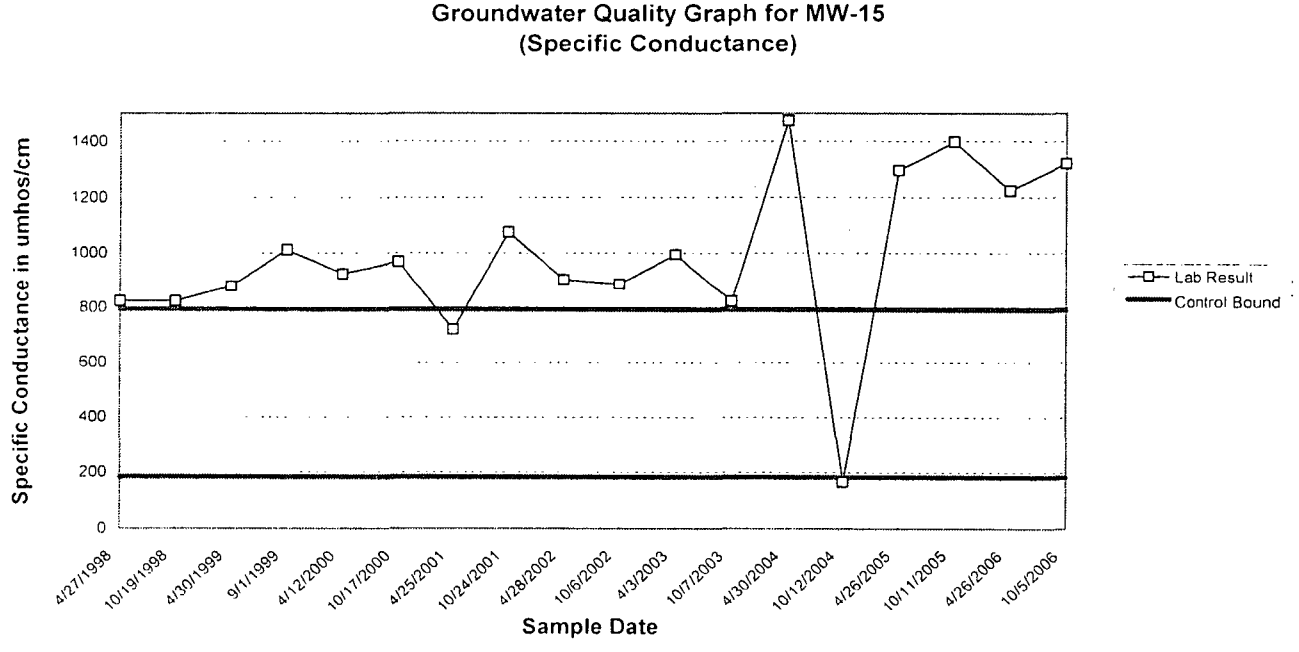


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-15

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-14* *(Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE										
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-14 Standard Deviation	MW-14 Mean	7/12/1996	10/10/1996	1/21/1997	4/17/1997	10/4/1997	4/22/1998	10/19/1998	4/30/1999	9/1/1999	4/12/2000	10/17/2000
Laboratory Parameters															
Chloride (mg/l)	4 823	0 634	16.248	27 161	12	14	13	17	15	18.5	19	20	18	17.7	17
Chemical Oxygen Demand (mg/l)	8.202	0.000	5.403	5.217	24	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**
Ammonia Nitrogen (mg/l)	0.100	0.100	0.025	0.105	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0 050	0.050	0.019	0.054	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Benzene (µg/l)	0 250	0 250	0.509	0 378	**0.5**	**0.5**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
1,2-Dichloroethane (µg/l)	0.404	0.051	0.215	0.324	**0.5**	**0.2**	**0.2**	**0.2**	0.41	**0.2**	0.54	1.1	**0.2**	**0.2**	**0.2**
1,1-Dichloroethene (µg/l)	1 000	1.000	0.158	0 947	**0.5**	**0.5**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	-	**1.0**	**1.0**	-
1,1,1-Trichloroethane (ug/l)	1.231	0.000	1.282	1.513	**0.5**	4.2	3.3	**0.5**	-	-	-	-	-	-	-
Trichloroethene (µg/l)	0.500	0.500	0.935	1.198	3.1	**0.5**	1.2	1.5	1.3	1.1	1.6	2.1	1.4	1.7	**0.5**
Phenols, Total (mg/l)	0.010	0 010	0.000	0 010	-	-	-	-	**0.01**	-	**0.01**	-	**0.01**	-	**0.01**
Total Organic Halogens (mg/l)	0 005	0.005	0 013	0.032	-	-	-	-	0.028	-	**0.005**	-	0.052	-	0 022
Field Parameters															
pH	8 1	6.0	0 336	6 644	6.6	6 7	6.5	6.3	6.5	6 5	6.4	6.1	6.1	6 0	6 3
Specific Conductance (µs/cm)	793	183	224.219	812.652	528	690	582	698	682	764	831	913	900	914	808

NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory detection limit (MDL) for parameters not detected
3) One-half of the MDL was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17)
4) One-half of the MDL was plotted for non-detectable parameters
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-14* *(Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE											
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-14 Standard Deviation	MW-14 Mean	4/25/2001	10/23/2001	4/28/2002	10/6/2002	4/3/2003	10/7/2003	4/30/2004	10/12/2004	4/26/2005	########	4/26/2006	10/5/2006
Laboratory Parameters																
Chloride (mg/l)	4.823	0.634	16.248	27.161	16.8	22.6	27.9	23.1	30.9	24.8	43.4	80.6	53.3	43.6	38.1	38.4
Chemical Oxygen Demand (mg/l)	8.202	0.000	5.403	5.217	**2.5**	**2.5**	**2.5**	15	7.7	10	**2.5**	6.0	5.3	**2.5**	**2.5**	12
Ammonia Nitrogen (mg/l)	0.100	0.100	0.025	0.105	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	0.22	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.019	0.054	0.14	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Benzene (µg/l)	0.250	0.250	0.509	0.378	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	2.69	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
1,2-Dichloroethane (µg/l)	0.404	0.051	0.215	0.324	0.4	0.5	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	0.2	**0.5**	**0.5**
1,1-Dichloroethene (µg/l)	1.000	1.000	0.158	0.947	-	-	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
1,1,1-Trichloroethane (ug/l)	1.231	0.000	1.282	1.513	-	-	-	-	-	-	**0.5**	1.79	1.42	1.29	**0.5**	1.13
Trichloroethene (µg/l)	0.500	0.500	0.935	1.198	1.1	1.1	1.1	**0.5**	**0.5**	**0.5**	4.25	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Phenols, Total (mg/l)	0.010	0.010	0.000	0.010	-	**0.01**	**0.01**	**0.01**	-	**0.01**	**0.01**	-	**0.01**	-	**0.01**	-
Total Organic Halogens (mg/l)	0.005	0.005	0.013	0.032	-	0.041	0.038	0.025	-	0.023	0.030	-	0.048	-	0.0391	-
Field Parameters																
pH	8.1	6.0	0.3	6.6	7.0	6.8	6.5	7	7	7.2	7	6.9	6.8	6.9	6.78	6.93
Specific Conductance (µs/cm)	793	183	224	813	941	889	742	757	930	1050	930	419	286	1237	1055	1145

NOTE:

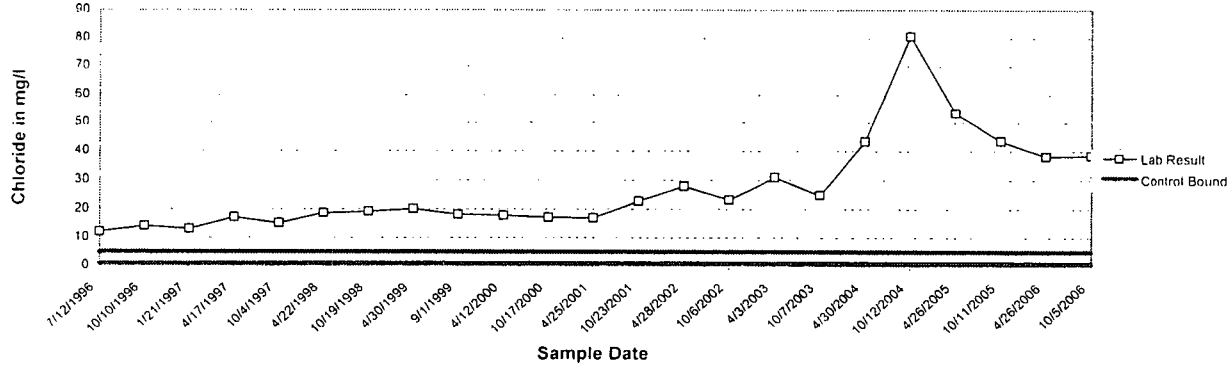
1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory Quantitative limit for parameters not detected.
3) One-half of the Quantitative limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the Quantitative limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-14
(Chloride)



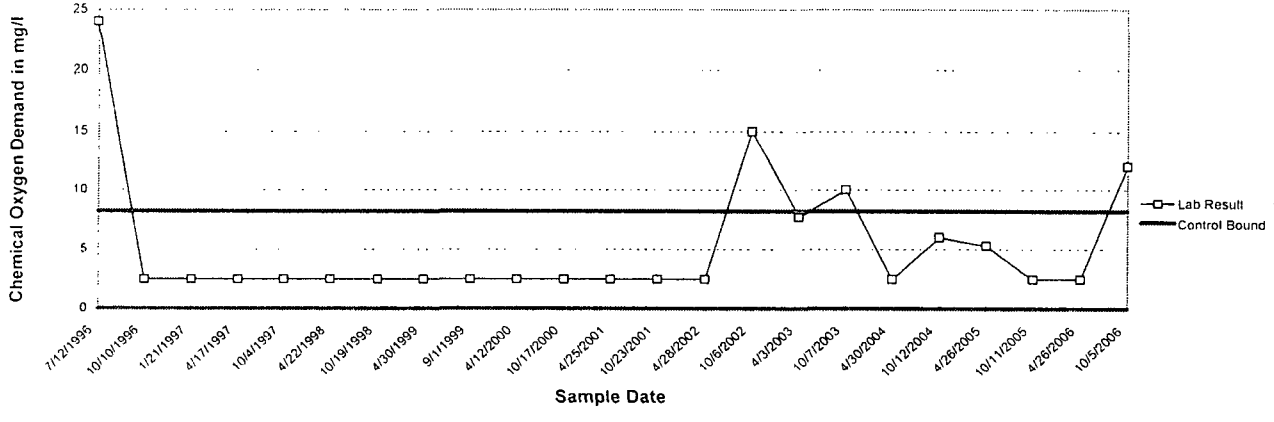
NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-14
(Chemical Oxygen Demand)

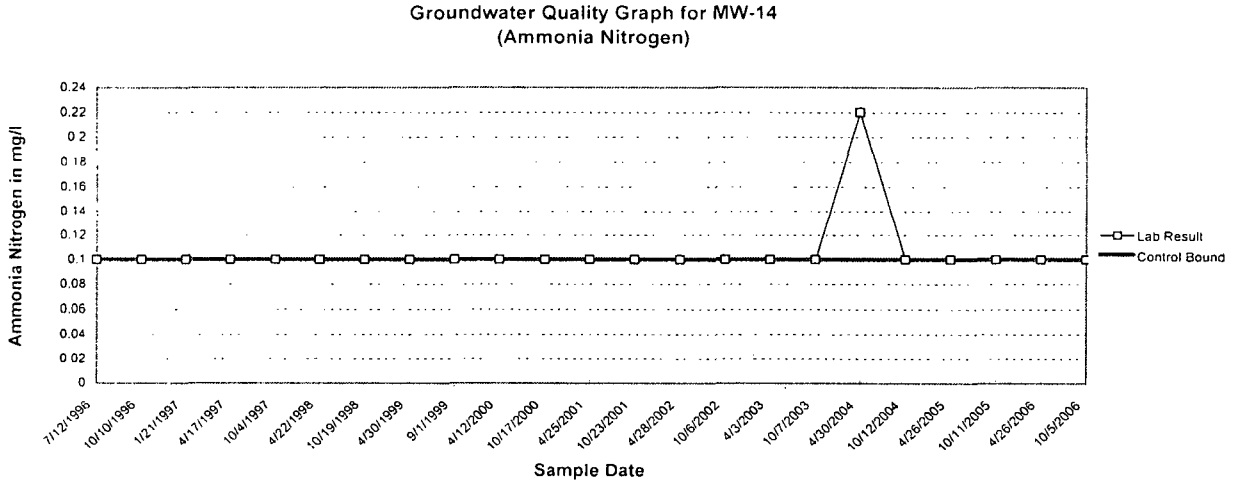


NOTE.
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the Quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

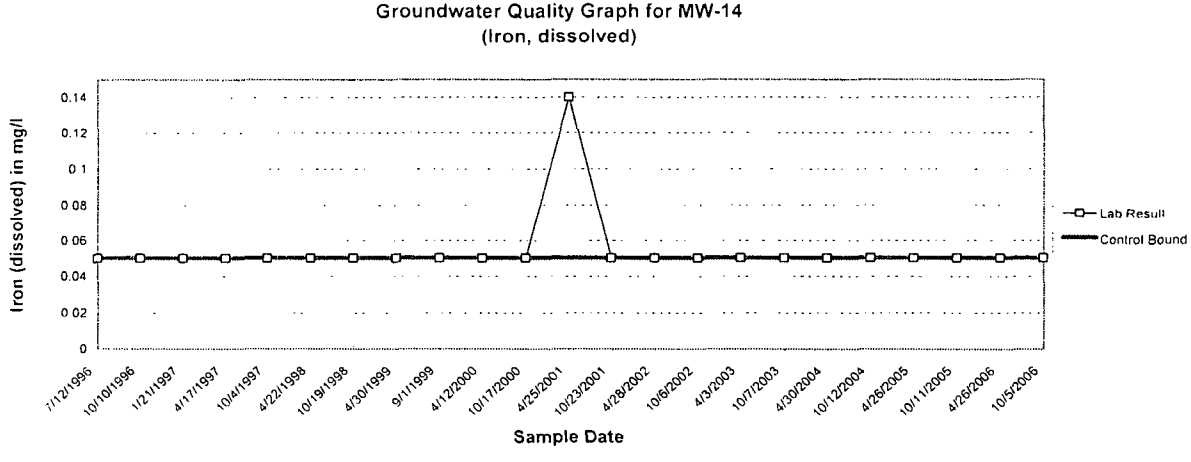


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

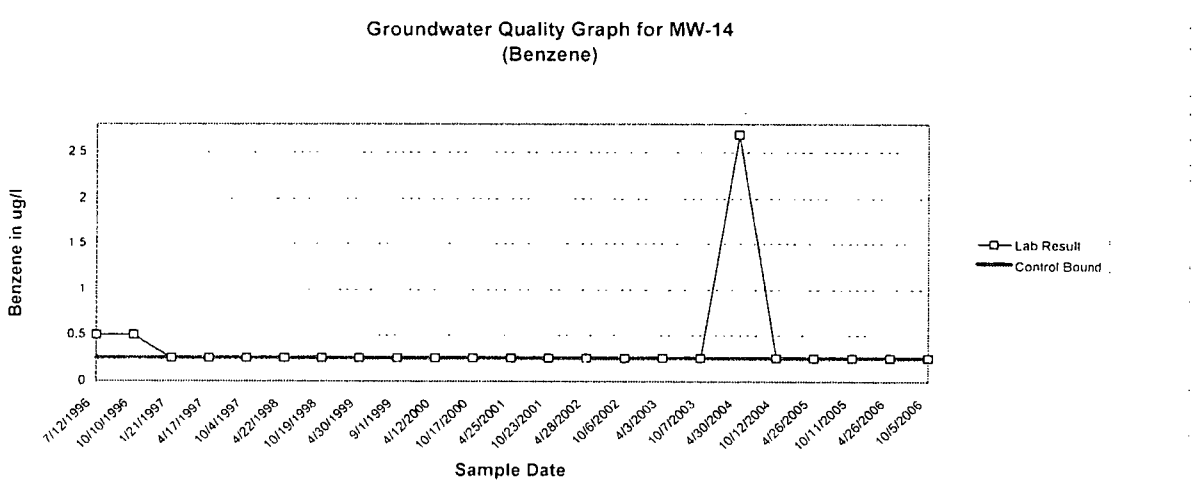


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data)
3) One-half of the Quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

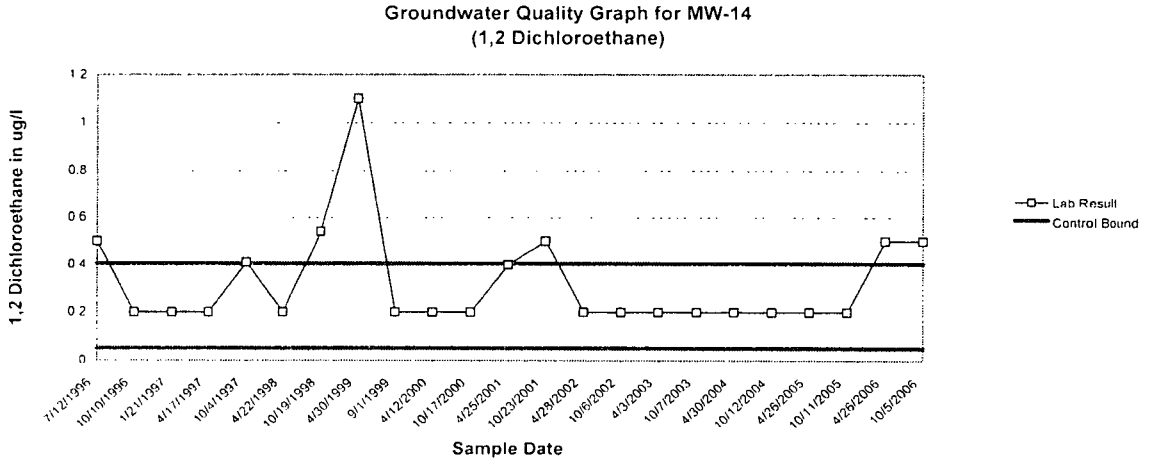


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data)
3) One-half of the Quantitative limit was plotted for non-detectable parameters

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

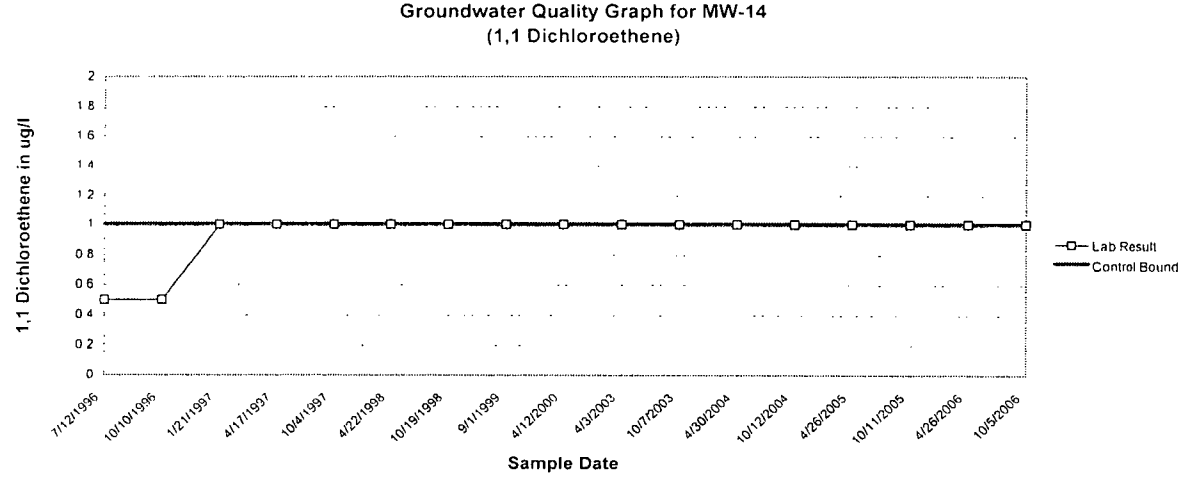


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the Quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

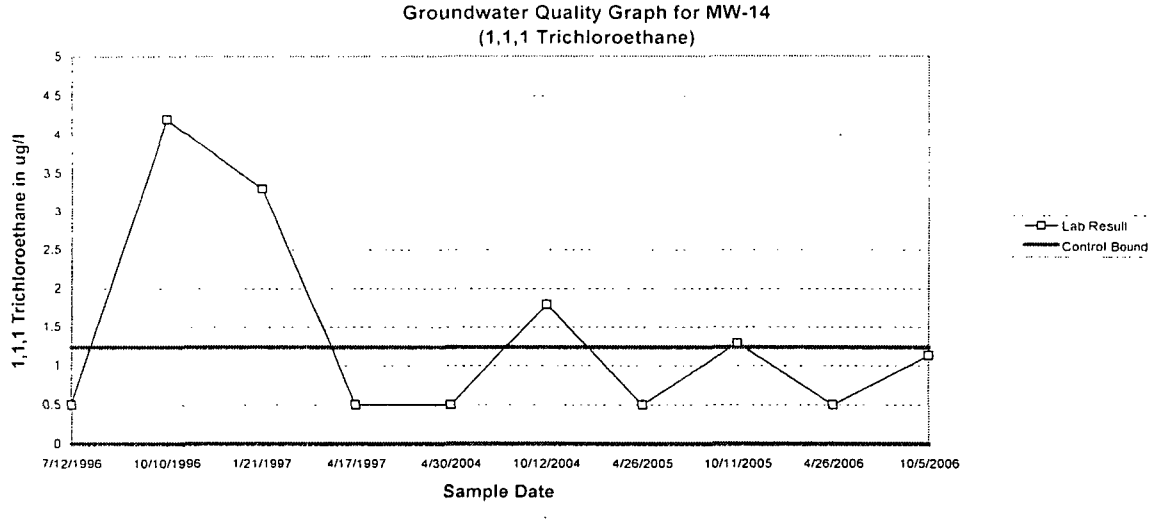


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

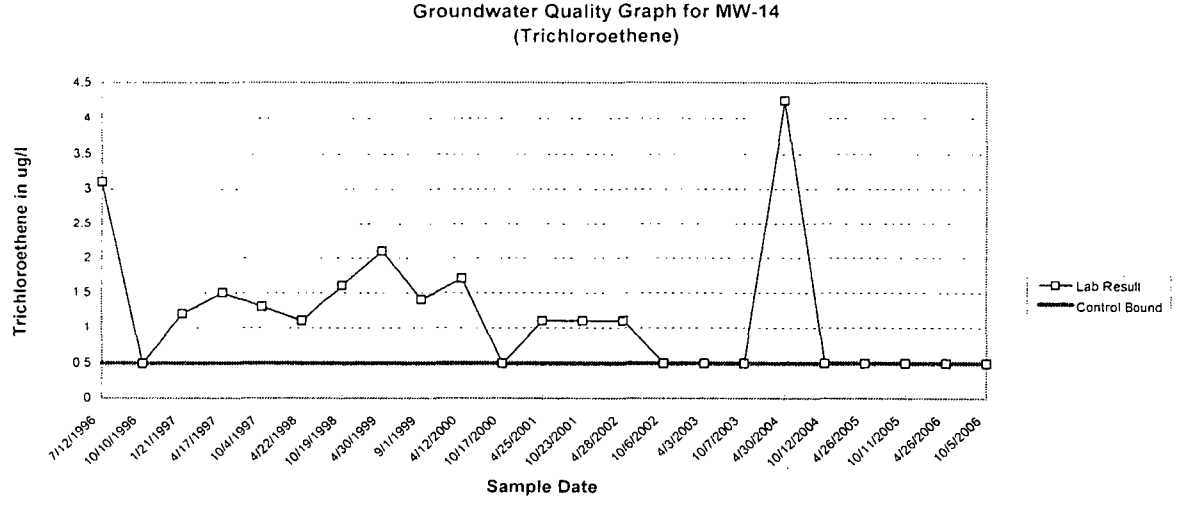


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the Quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



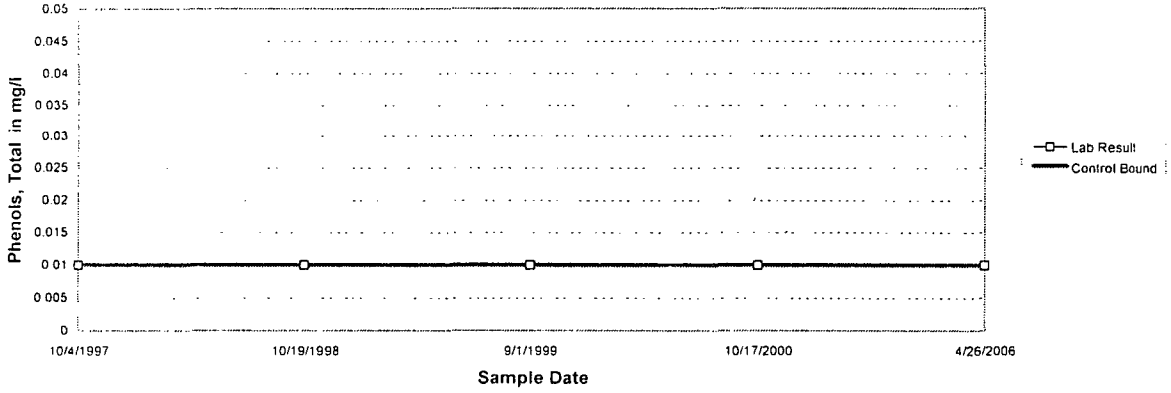
NOTE.
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-14
(Phenols, Total)



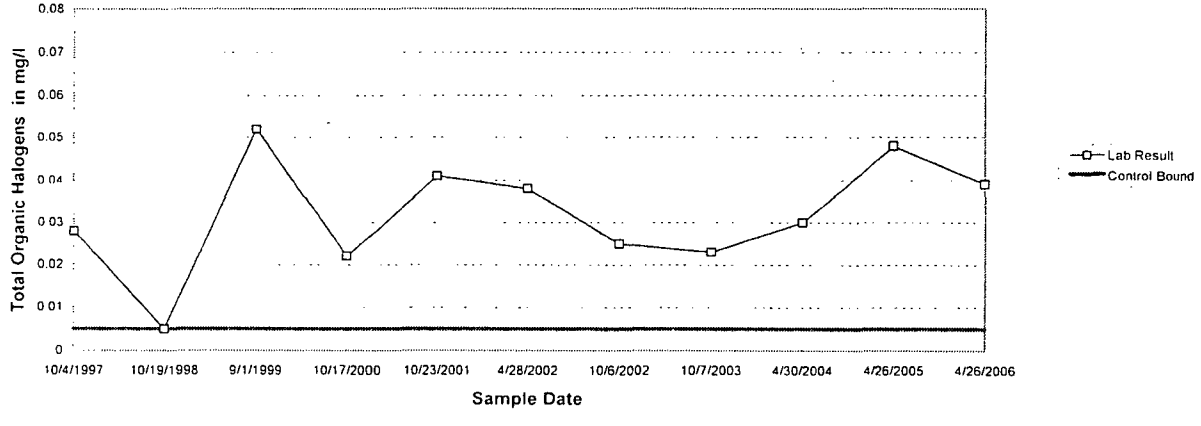
NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the Quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-14
(Total Organic Halogens)

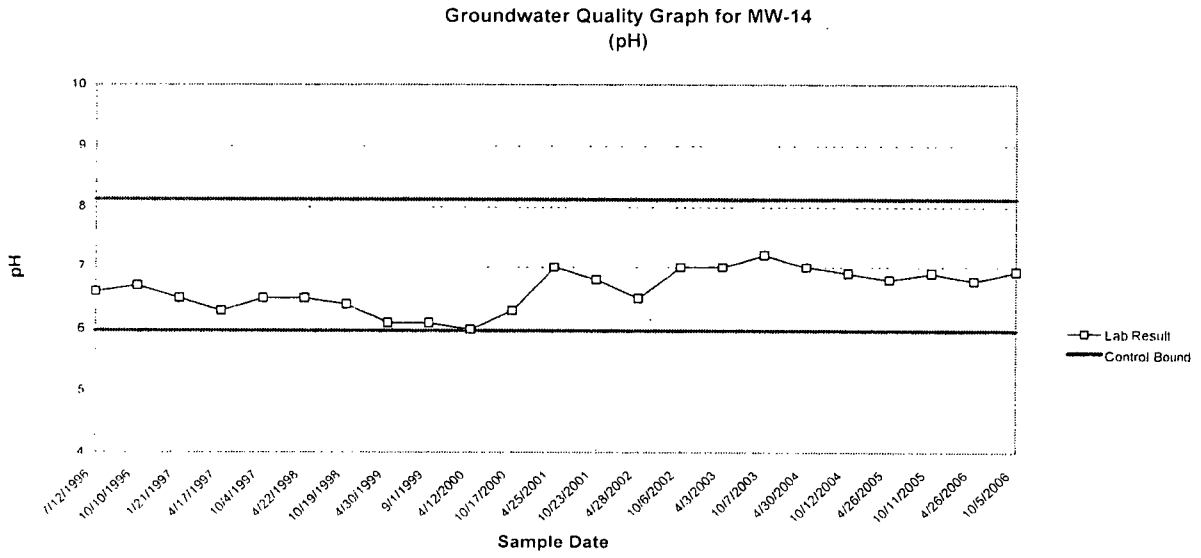


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i e there was no deviation from the mean of the data)
3) One-half of the Quantitative limit was plotted for non-detectable parameters

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

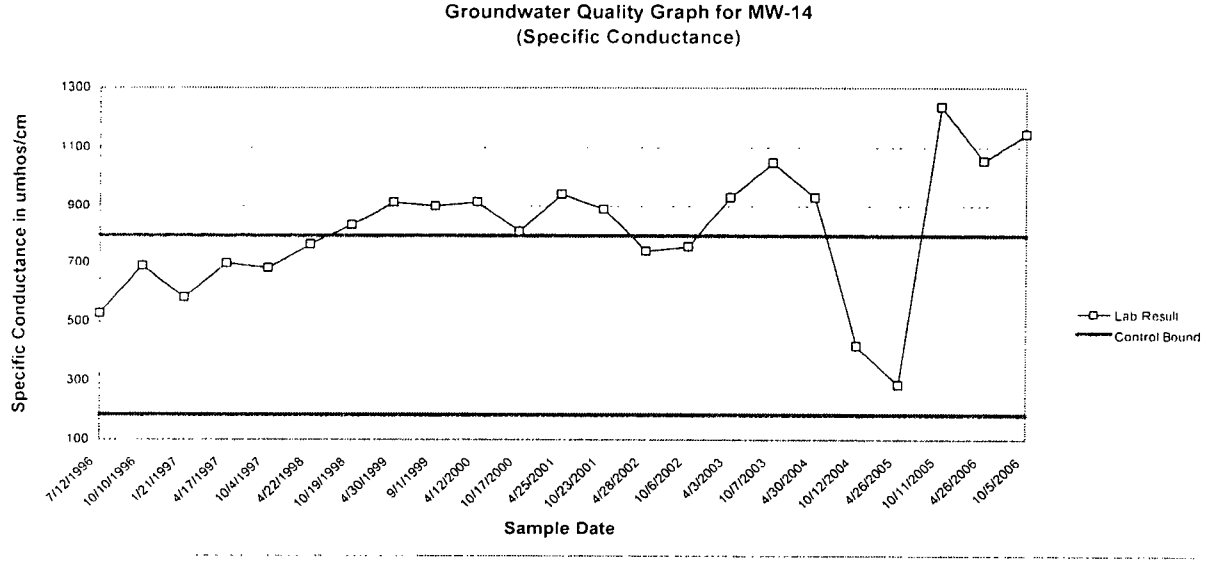


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits

ANALYSIS SHEET MW-14

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-13 (Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE										
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-13 Standard Deviation	MW-13 Mean	7/12/1996	10/11/1996	1/21/1997	4/17/1997	10/4/1997	4/22/1998	10/19/1998	4/30/1999	9/3/1999	4/12/2000	10/17/2000
Laboratory Parameters															
Chloride (mg/l)	4.823	0 634	2.976	17.081	12	13	14	18	18	15.6	18	17	18	17.5	19.9
Chemical Oxygen Demand (mg/l)	8.202	0.000	13.486	8.090	63	**2.5**	7.5	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	22	**2.5**
Ammonia Nitrogen (mg/l)	0 100	0 100	0.022	0.105	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	0.2	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	1.007	0.660	0.9	3.4	3.6	**0.05**	0.49	0.20	0.05	0.05	0.72	1.05	**0.05**
Benzene (µg/l)	0 250	0.250	0 110	0.306	**0.5**	**0.5**	**0.25**	**0.25**	-	-	-	-	-	-	**0.25**
1,2-Dichloroethane (µg/l)	0.404	0.051	0.100	0.233	**0.5**	**0.2**	**0.2**	**0.2**	-	-	-	-	-	-	**0.2**
1,1-Dichloroethene (µg/l)	1.000	1.000	0.258	0.833	**0.5**	**0.5**	**1.0**	**1.0**	-	-	-	-	-	-	-
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.000	0.500	**0.5**	**0.5**	**0.5**	**0.5**	-	-	-	-	-	-	-
Trichloroethene (µg/l)	0.500	0.500	0.000	0.500	**0.5**	**0.5**	**0.5**	**0.5**	-	-	-	-	-	-	**0.5**
Phenols, Total (mg/l)	0.010	0.010	0.000	0.010	-	-	-	-	**0.01**	-	**0.01**	-	**0.01**	-	**0.01**
Total Organic Halogens (mg/l)	0.005	0.005	0.042	0.021	-	-	-	-	**0.005**	-	**0.005**	-	0.138	-	**0.005**
Field Parameters															
pH	8.1	6.0	0.417	6.714	6.5	6.8	6.8	6.6	6.4	6.5	6.6	6.4	6.1	6.2	5.8
Specific Conductance (µs/cm)	793	183	136.259	573.714	390	475	479	645	548	584	525	605	558	517	536

NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory detection limt (MDL) for parameters not detected.
3) One-half of the MDL was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the MDL was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-13 (Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE										
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-13 Standard Deviation	MW-13 Mean	4/25/2001	10/23/2001	4/28/2002	10/6/2002	4/3/2003	10/7/2003	4/30/2004	10/12/2004	4/26/2005	10/11/2005	4/26/2006
Laboratory Parameters															
Chloride (mg/l)	4.823	0.634	2.976	17.081	15.1	16.7	16.6	16.5	24.8	19.7	19.3	18.4	11.6	19.0	18.8
Chemical Oxygen Demand (mg/l)	8.202	0.000	13.486	8.090	6.3	**2.5**	8.2	8.4	10	**2.5**	12	**2.5**	**2.5**	**2.5**	6.3
Ammonia Nitrogen (mg/l)	0.100	0.100	0.022	0.105	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	1.007	0.660	0.16	**0.05**	0.71	0.85	**0.05**	0.88	**0.05**	**0.05**	0.15	0.34	0.56
Benzene (µg/l)	0.250	0.250	0.110	0.306	**0.25**	**0.25**	-	-	**0.25**	**0.25**	-	-	-	-	-
1,2-Dichloroethane (µg/l)	0.404	0.051	0.100	0.233	**0.2**	**0.2**	-	-	**0.2**	**0.2**	-	-	-	-	-
1,1-Dichloroethene (µg/l)	1.000	1.000	0.258	0.833	-	-	-	-	**1.0**	**1.0**	-	-	-	-	-
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.000	0.500	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene (µg/l)	0.500	0.500	0.000	0.500	**0.5**	**0.5**	-	-	**0.5**	**0.5**	-	-	-	-	-
Phenols, Total (mg/l)	0.010	0.010	0.000	0.010	-	**0.01**	**0.01**	**0.01**	**0.01**	-	**0.01**	-	**0.01**	-	**0.01**
Total Organic Halogens (mg/l)	0.005	0.005	0.042	0.021	-	**0.005**	**0.005**	**0.005**	0.023	-	**0.005**	-	0.013	-	**0.005**
Field Parameters															
pH	8.1	6.0	0.4	6.7	6.8	7.1	6.7	7.3	7.0	7.5	6.6	7.2	7.0	7.1	7.3
Specific Conductance (µs/cm)	793	183	136	574	648	530	423	499	930	646	792	346	608	764	641

NOTE:

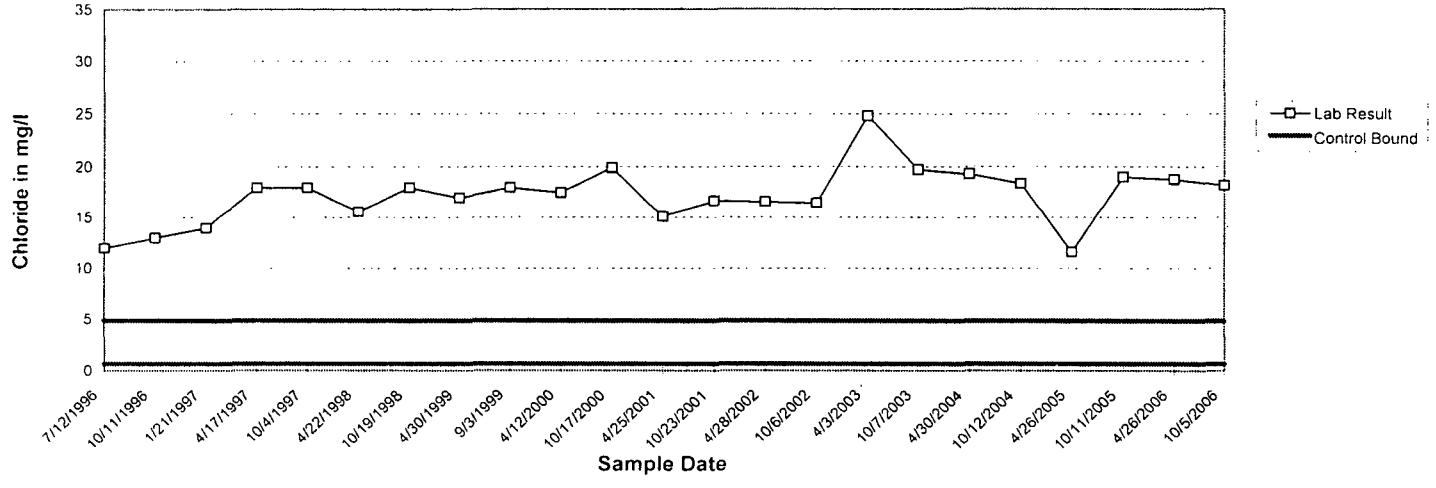
1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory quantitative limit for parameters not detected.
3) One-half of the quantitative limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the quantitative limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-13
(Chloride)



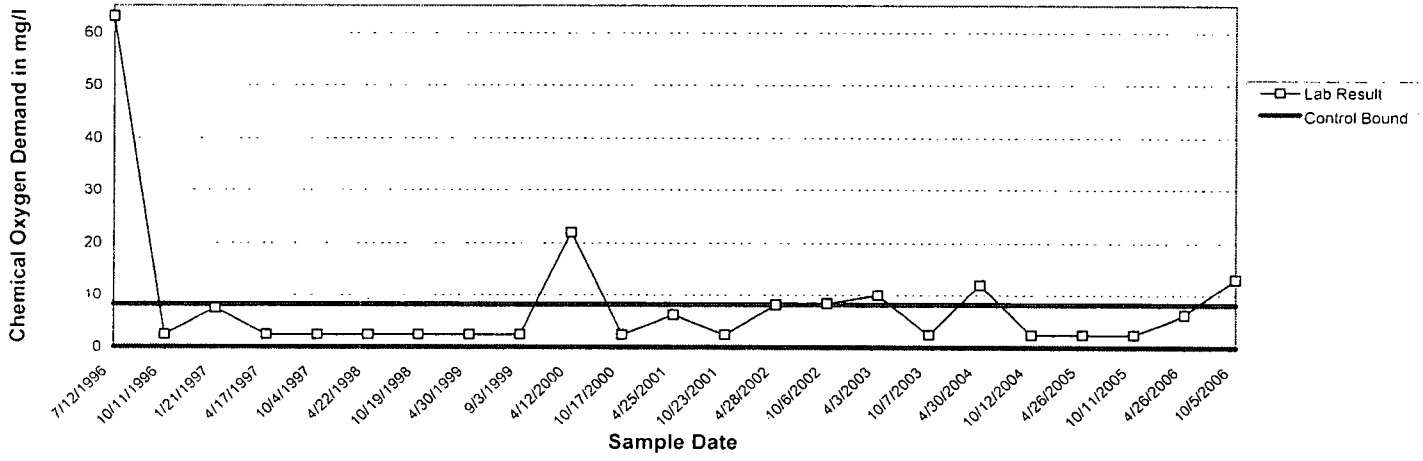
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-13
(Chemical Oxygen Demand)

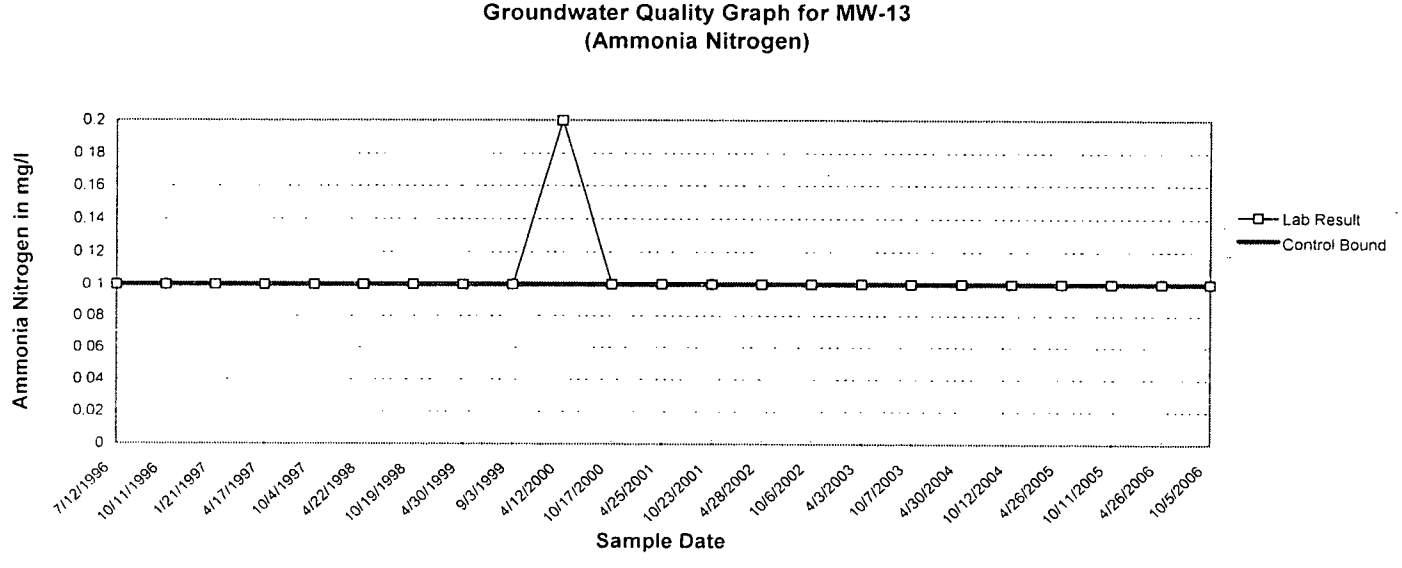


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

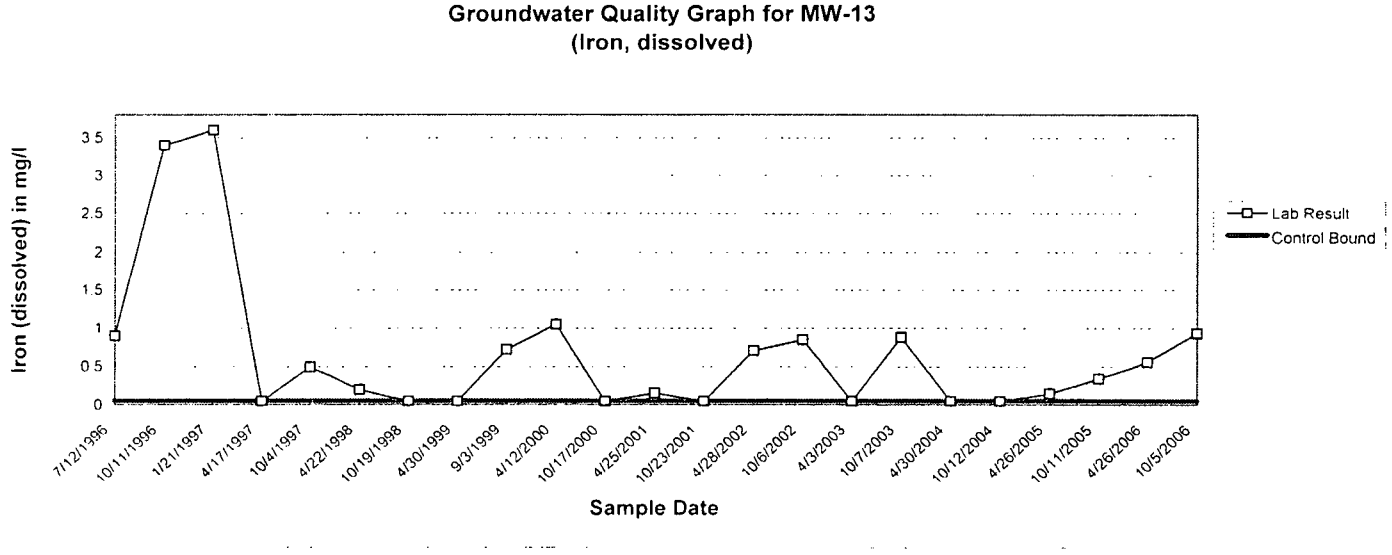


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

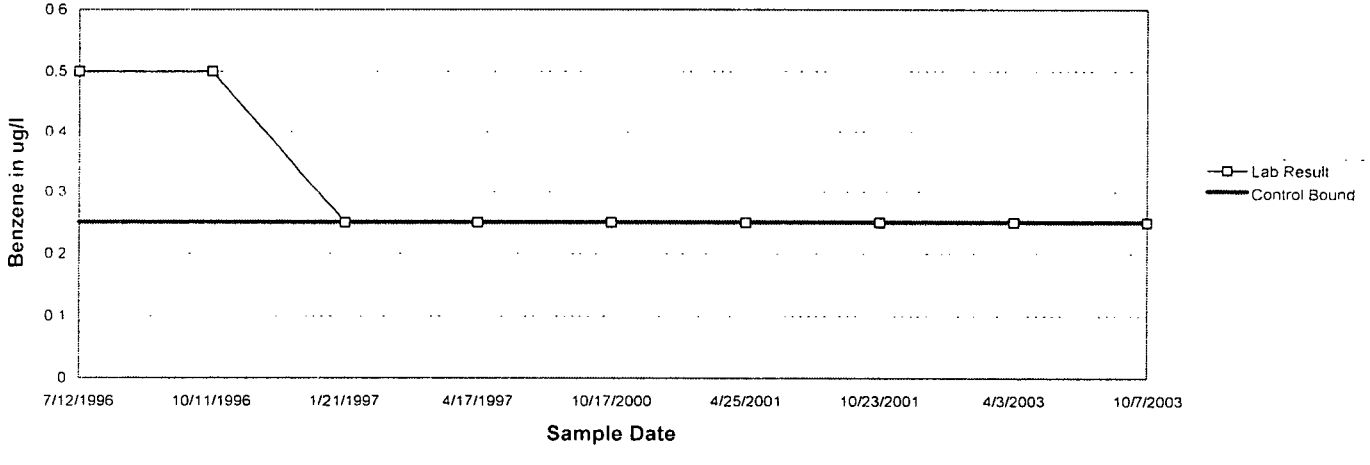


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

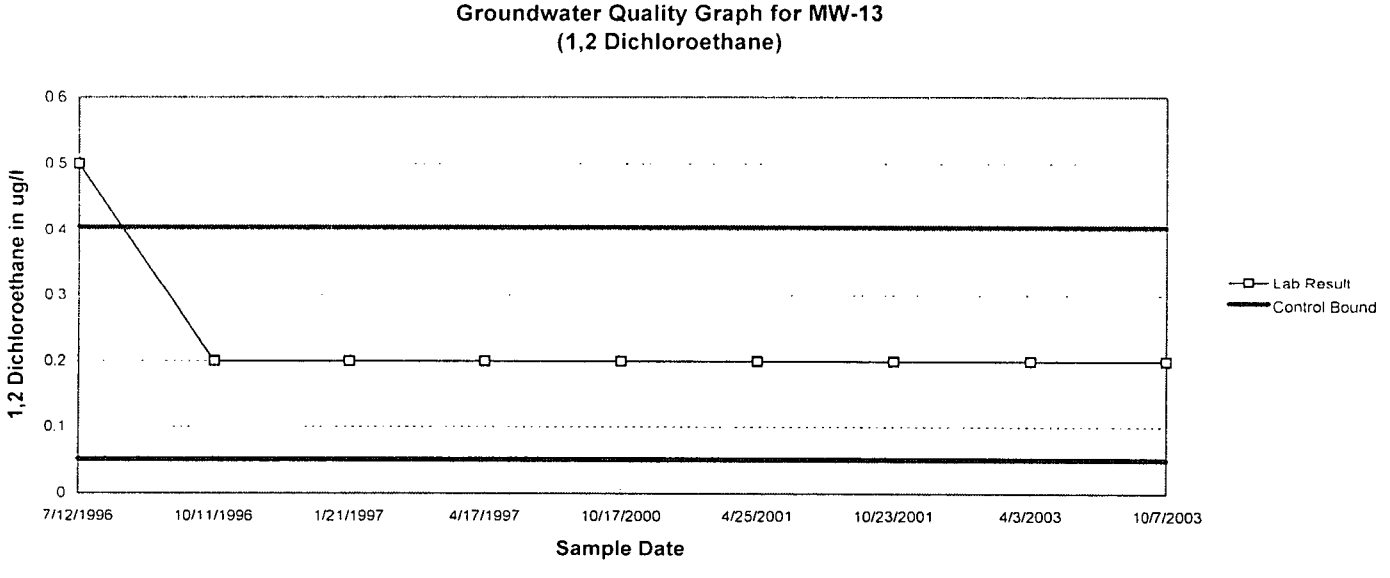


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

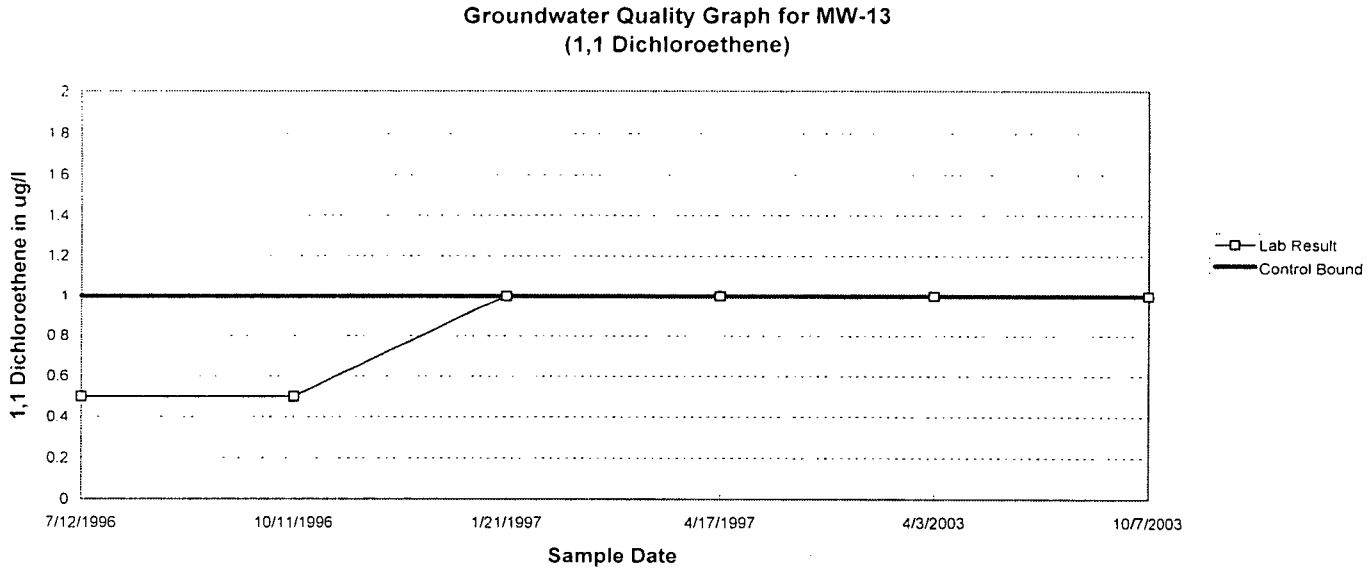


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

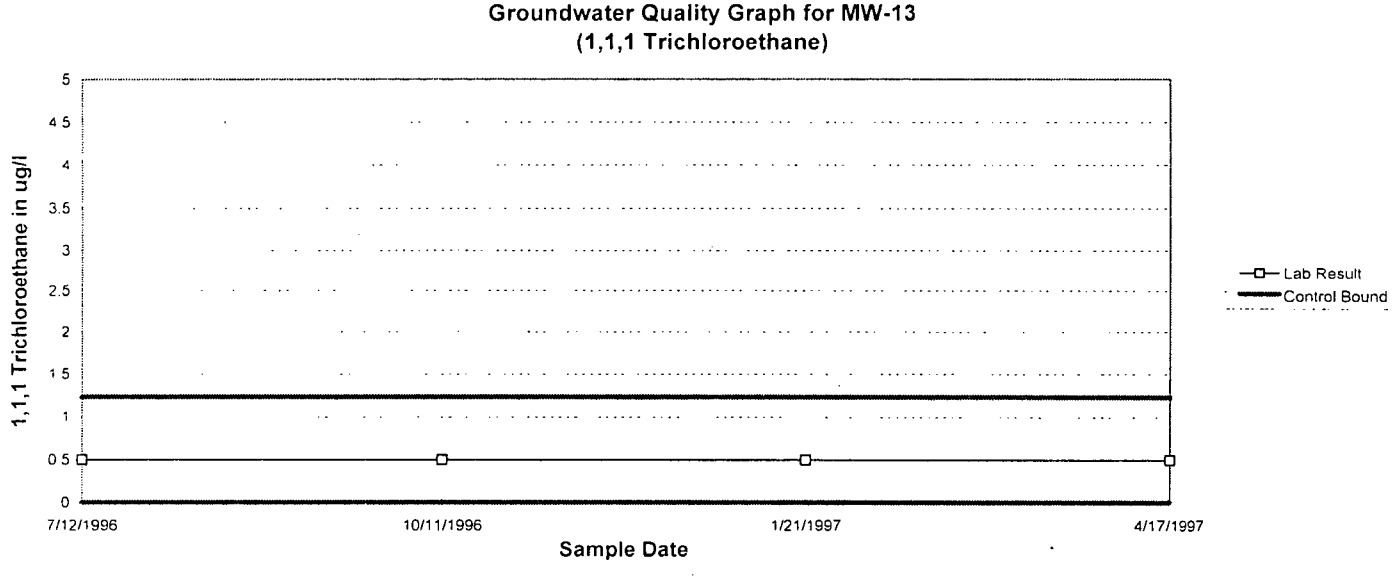


NOTE.
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

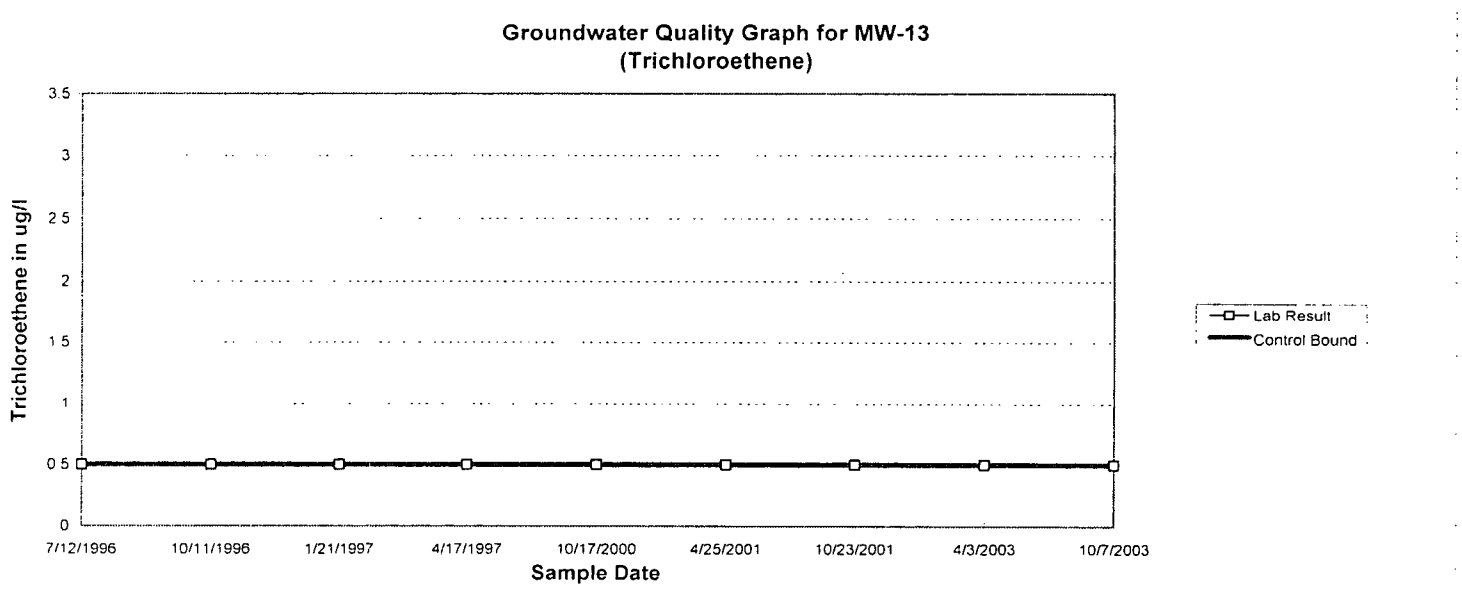


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

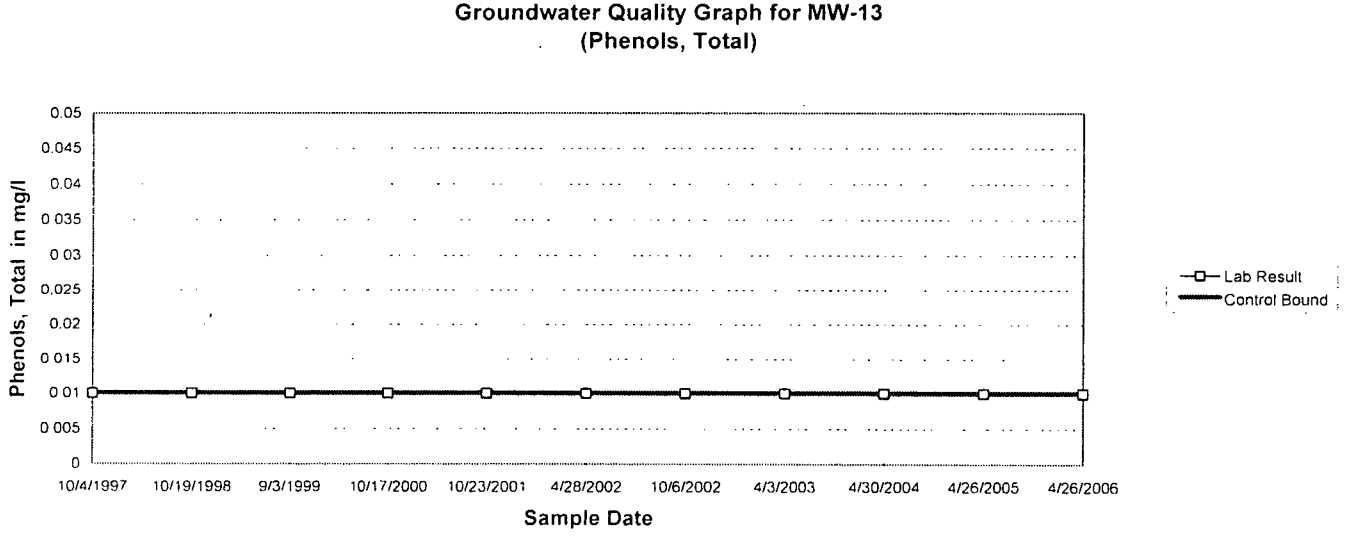


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

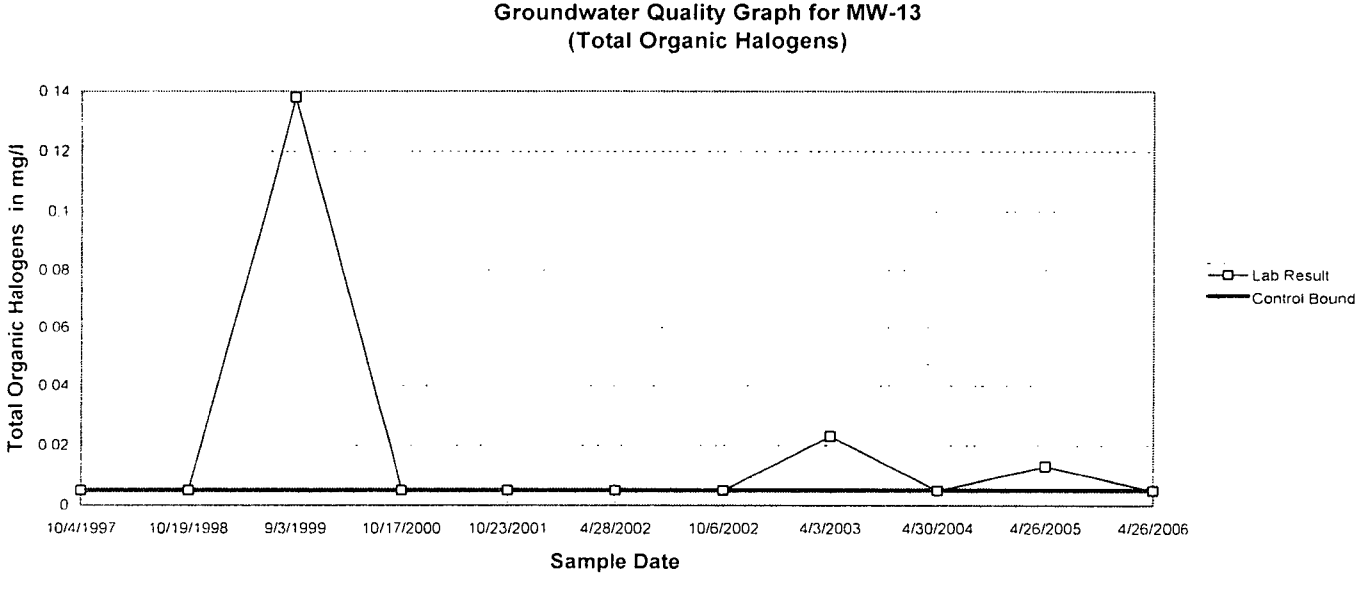


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

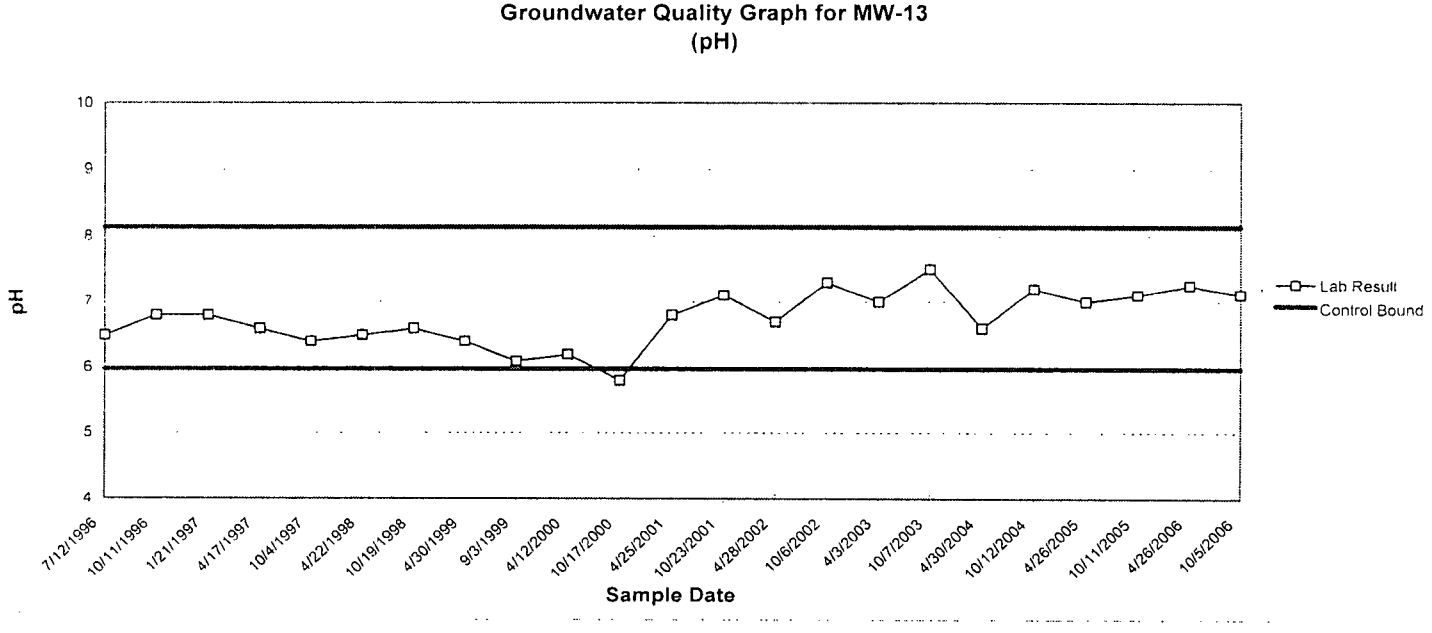


NOTE.
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

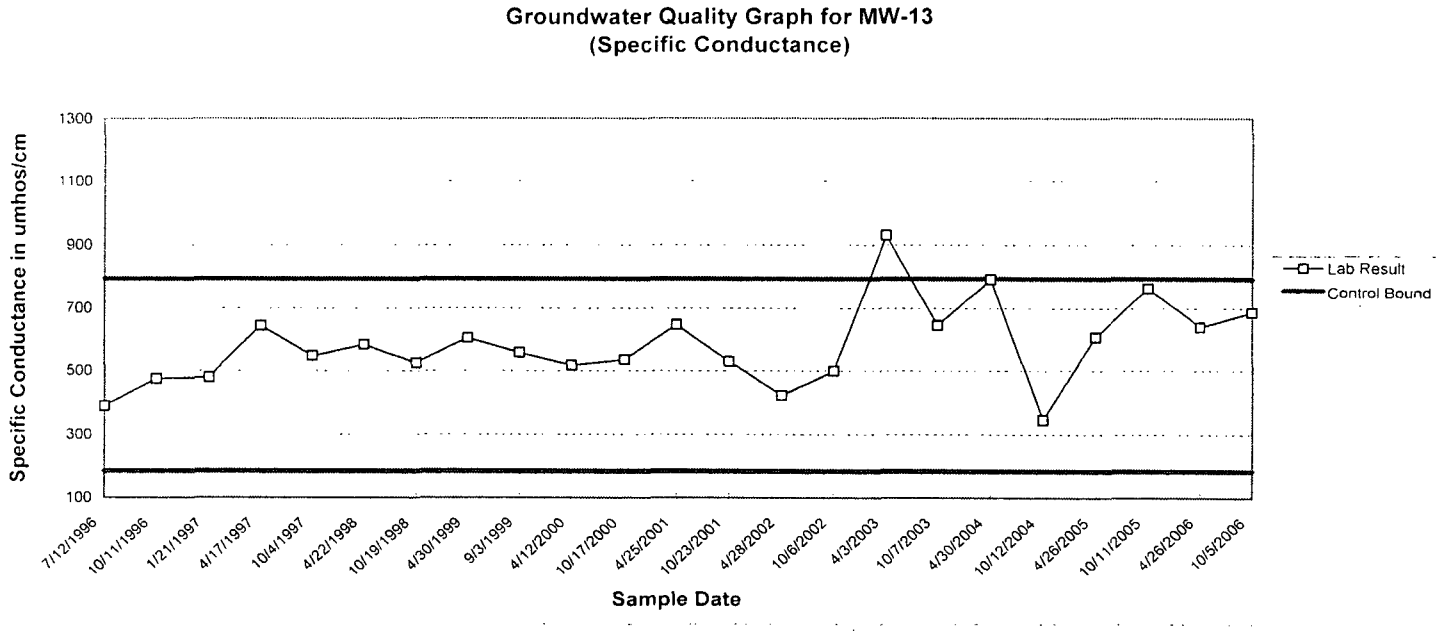


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-13

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



NOTE.
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-12* *(Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE										
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-12 Standard Deviation	MW-12 Mean	10/10/1996	1/21/1997	4/17/1997	7/15/1997	10/4/1997	4/22/1998	10/19/1998	4/30/1999	9/3/1999	4/12/2000	10/17/2000
Laboratory Parameters															
Chloride (mg/l)	4.823	0.634	20.156	19.608	5.4	6.4	7.5	6.8	6.6	8.1	7.4	9.6	8.3	6.4	7.9
Chemical Oxygen Demand (mg/l)	8.202	0.000	5.200	5.383	7.0	11	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**
Ammonia Nitrogen (mg/l)	0.100	0.100	0.023	0.105	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	0.21	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.550	0.247	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Benzene (µg/l)	0.250	0.250	1.026	2.475	**0.5**	2.1	2.2	2.1	2.4	2.7	3.1	3.3	3.0	3	3.5
1,2-Dichloroethane (µg/l)	0.404	0.051	0.251	0.279	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**
1,1-Dichloroethene (µg/l)	1.000	1.000	0.118	0.972	**0.5**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	-	**1.0**	**1.0**	-
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.696	0.930	1.8	2.1	**0.5**	1.9	-	-	-	-	-	-	-
Trichloroethene (µg/l)	0.500	0.500	1.080	4.605	2.8	5.5	4.9	4.7	4.7	4.8	5.4	5.6	4.8	5.3	5.4
Phenols, Total (mg/l)	0.010	0.010	0.000	0.010	-	-	-	-	**0.01**	-	**0.01**	-	**0.01**	-	**0.01**
Total Organic Halogens (mg/l)	0.005	0.005	0.016	0.052	-	-	-	-	0.083	-	0.023	-	0.064	-	0.055
Field Parameters															
pH	8.1	6.0	0.430	6.259	6.4	6.2	6.2	6.1	5.0	6.0	6	6	5.8	5.7	5.8
Specific Conductance (µs/cm)	793	183	291.208	1044.652	1026	922	1010	1017	906	1044	1046	1102	1171	1087	1129

NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory quantitative limit for parameters not detected.
3) One-half of the quantitative limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the quantitative limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-12* *(Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE											
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-12 Standard Deviation	MW-12 Mean	4/25/2001	10/23/2001	4/28/2002	10/6/2002	4/3/2003	10/7/2003	4/30/2004	10/12/2004	4/26/2005	10/11/2005	4/26/2006	10/5/2006
Laboratory Parameters																
Chloride (mg/l)	4.823	0.634	20.156	19.608	8.0	16.2	17.4	27	43.1	81.1	60.4	50.1	21.5	21.4	9.88	14.5
Chemical Oxygen Demand (mg/l)	8.202	0.000	5.200	5.383	**2.5**	**2.5**	8.5	22	13	**2.5**	8.2	**2.5**	**2.5**	**2.5**	**2.5**	14.1
Ammonia Nitrogen (mg/l)	0.100	0.100	0.023	0.105	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.550	0.247	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	0.3	1.5	2.29	0.65
Benzene (µg/l)	0.250	0.250	1.026	2.475	2.8	4.3	3.6	3.59	-	2.88	**0.25**	2.74	2.3	1.76	1.22	1.11
1,2-Dichloroethane (µg/l)	0.404	0.051	0.251	0.279	**0.2**	**0.2**	**0.2**	**0.2**	-	**0.2**	1.33	**0.2**	**0.2**	**0.2**	**0.5**	**0.5**
1,1-Dichloroethene (µg/l)	1.000	1.000	0.118	0.972	-	-	**1.0**	**1.0**	-	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1**
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.696	0.930	-	-	-	-	-	-	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Trichloroethene (µg/l)	0.500	0.500	1.080	4.605	4.7	5.6	4.6	5.35	-	3.93	6.57	4.05	3.6	4.19	2.95	1.88
Phenols, Total (mg/l)	0.010	0.010	0.000	0.010	-	**0.01**	**0.01**	**0.01**	**0.01**	-	**0.01**	-	**0.01**	-	**0.01**	-
Total Organic Halogens (mg/l)	0.005	0.005	0.016	0.052	-	0.058	0.059	0.044	0.057	-	0.054	-	0.038	-	0.0414	-
Field Parameters																
pH	8.1	6.0	0.4	6.3	6.7	6.4	6.2	6.7	6.7	6.8	6.3	6.6	6.4	6.6	6.69	6.66
Specific Conductance (µs/cm)	793	183	291	1045	1223	1165	1040	1051	1319	671	1106	496	182	1571	1374	1369

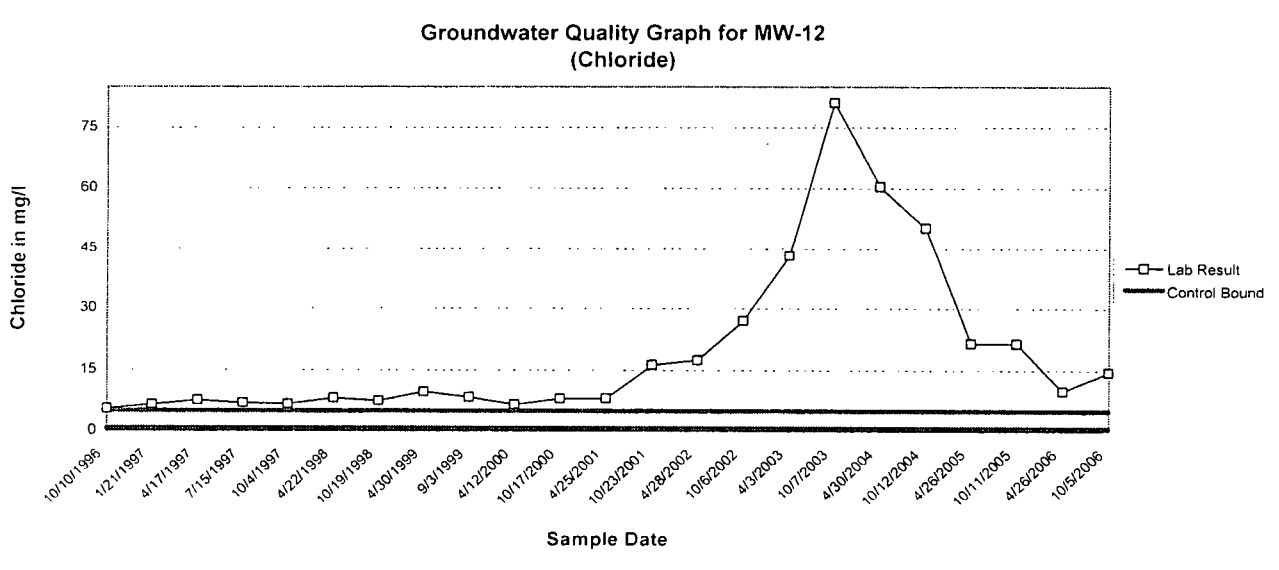
NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory quantitative limit for parameters not detected.
3) One-half of the quantitative limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the quantitative limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

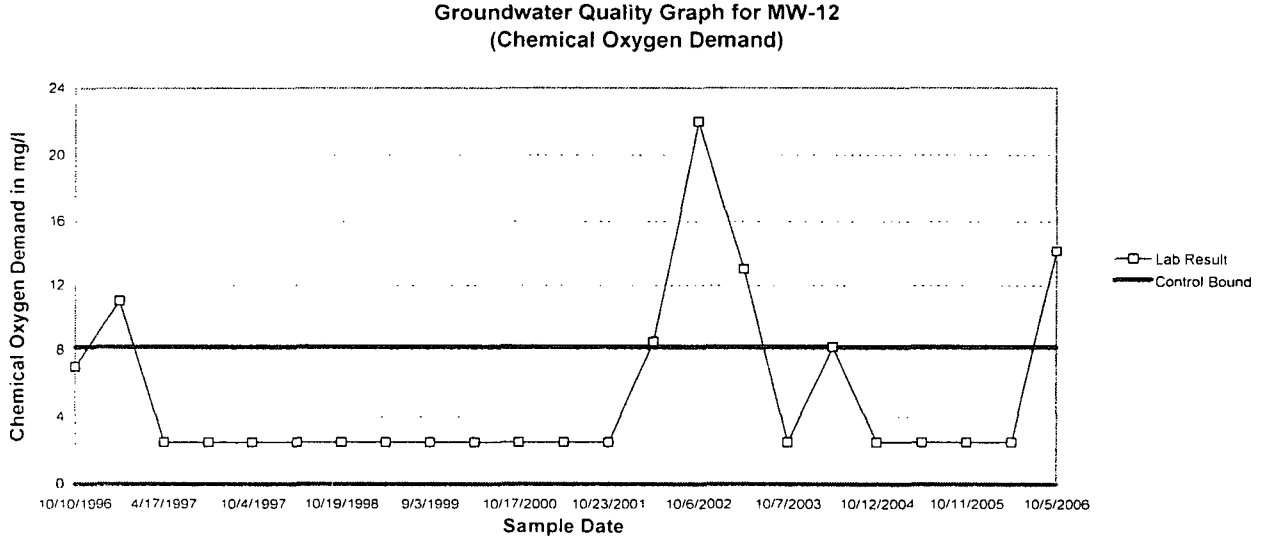


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

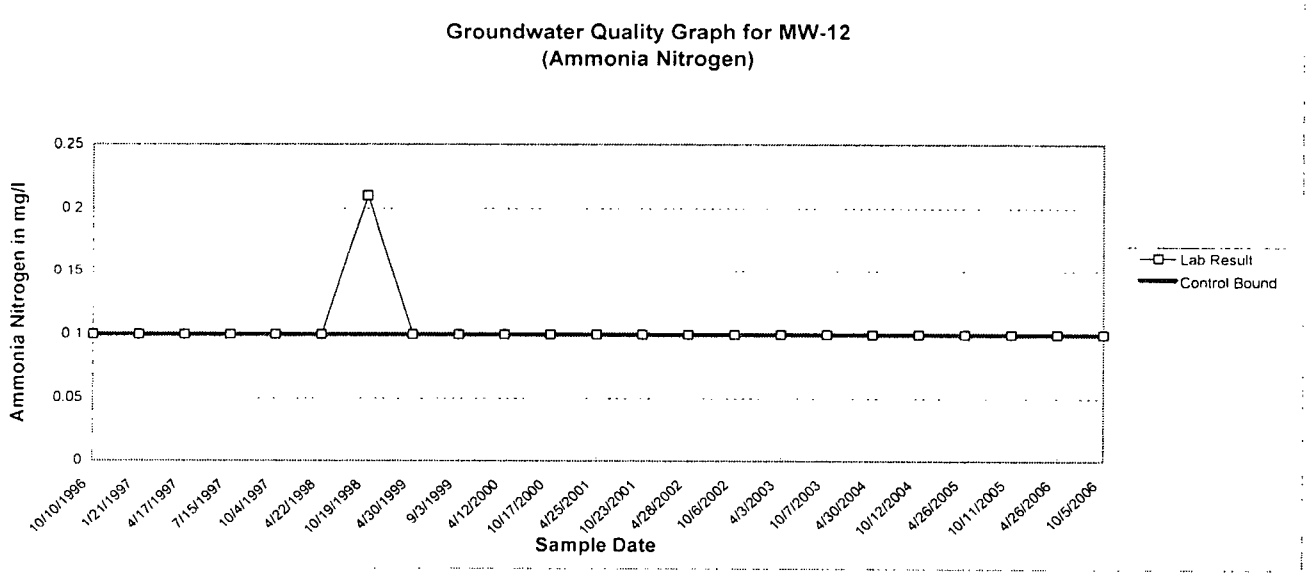


NOTE.
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters..

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



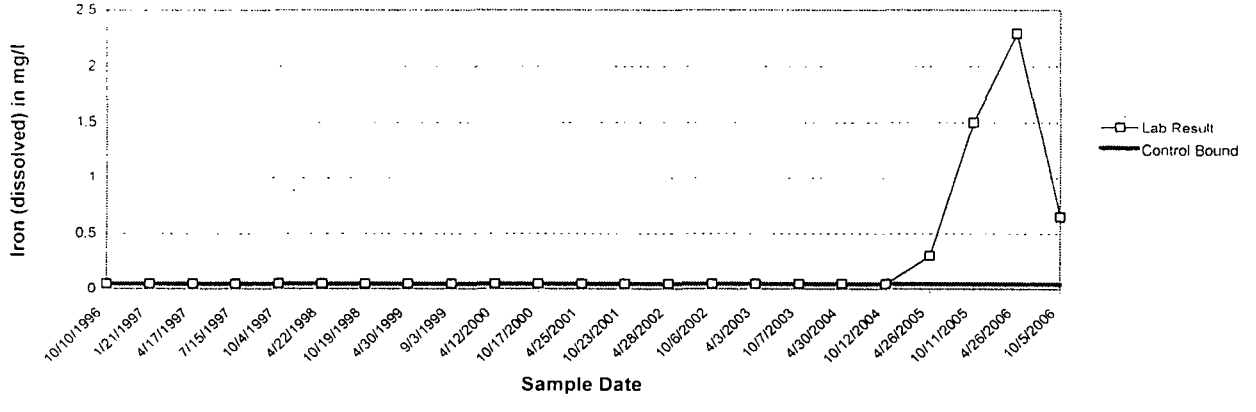
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-12
(Iron, dissolved)



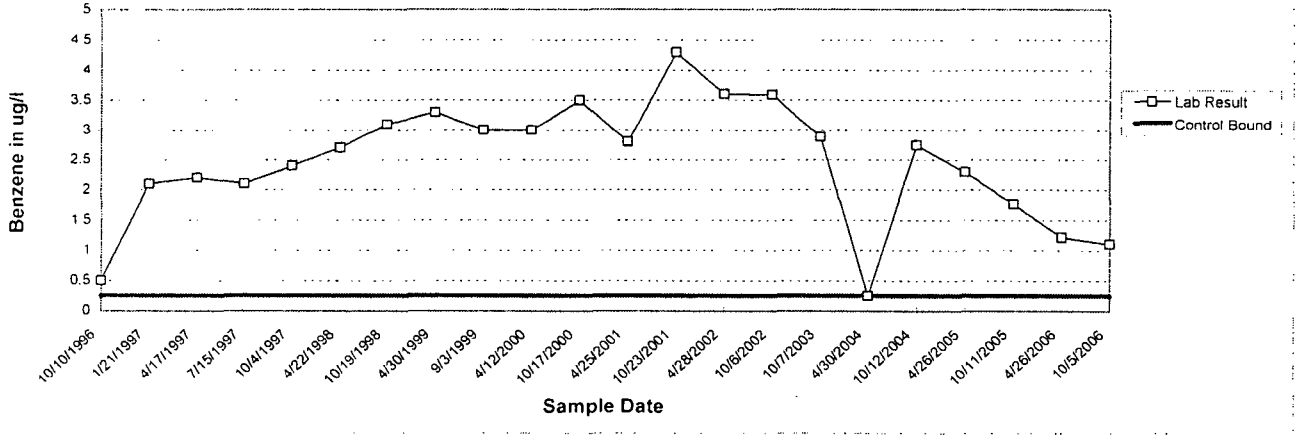
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-12
(Benzene)

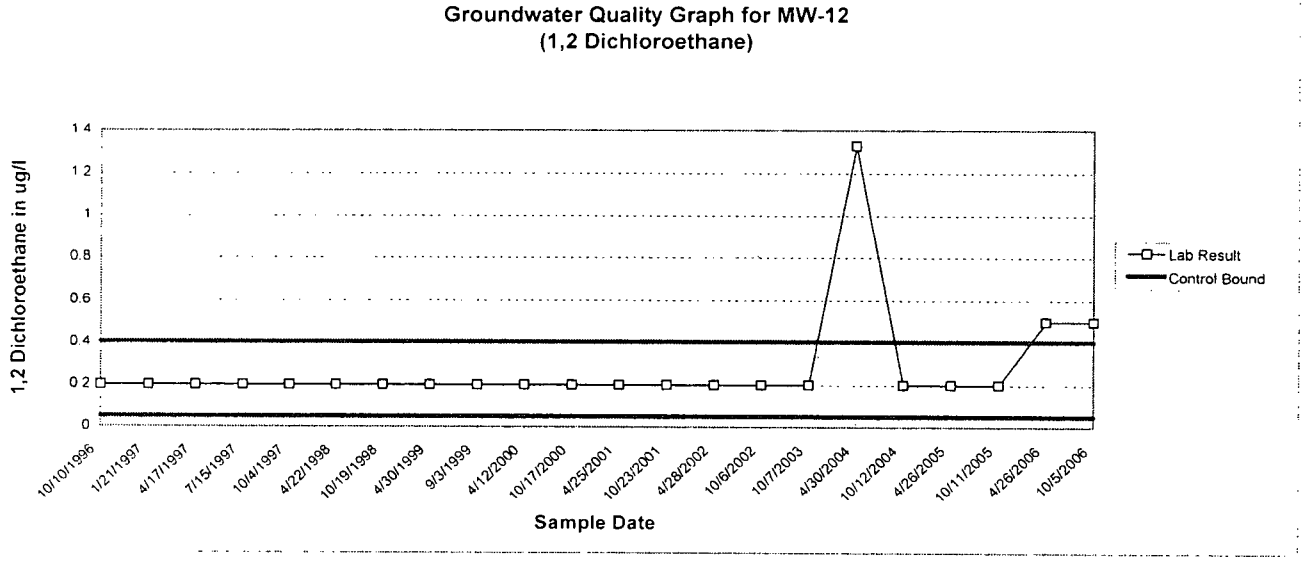


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

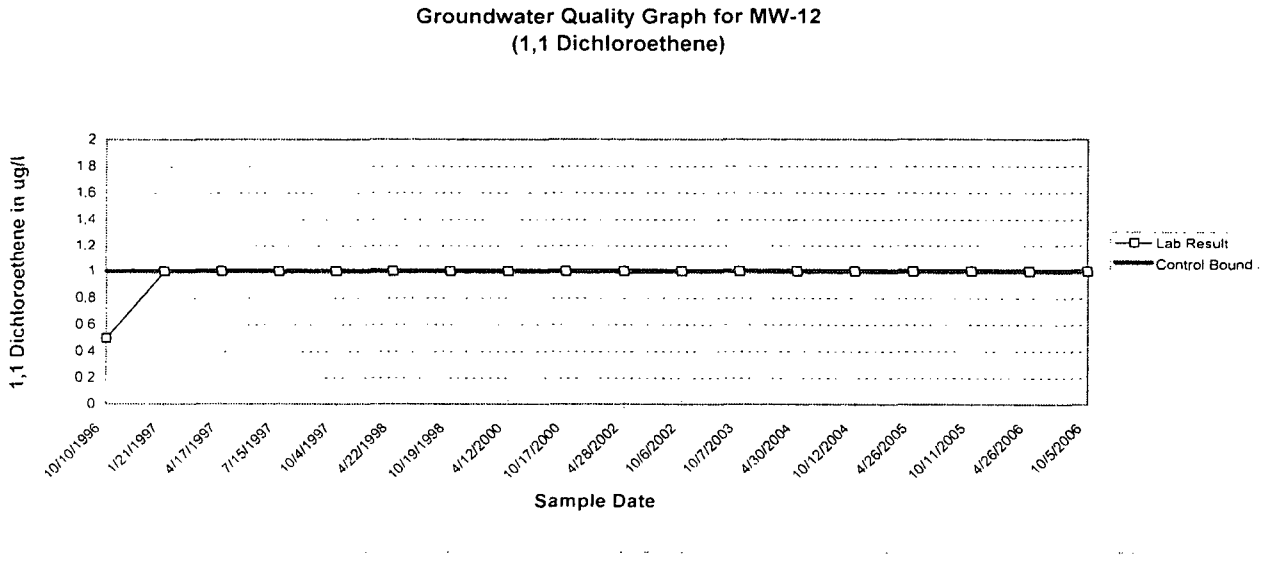


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

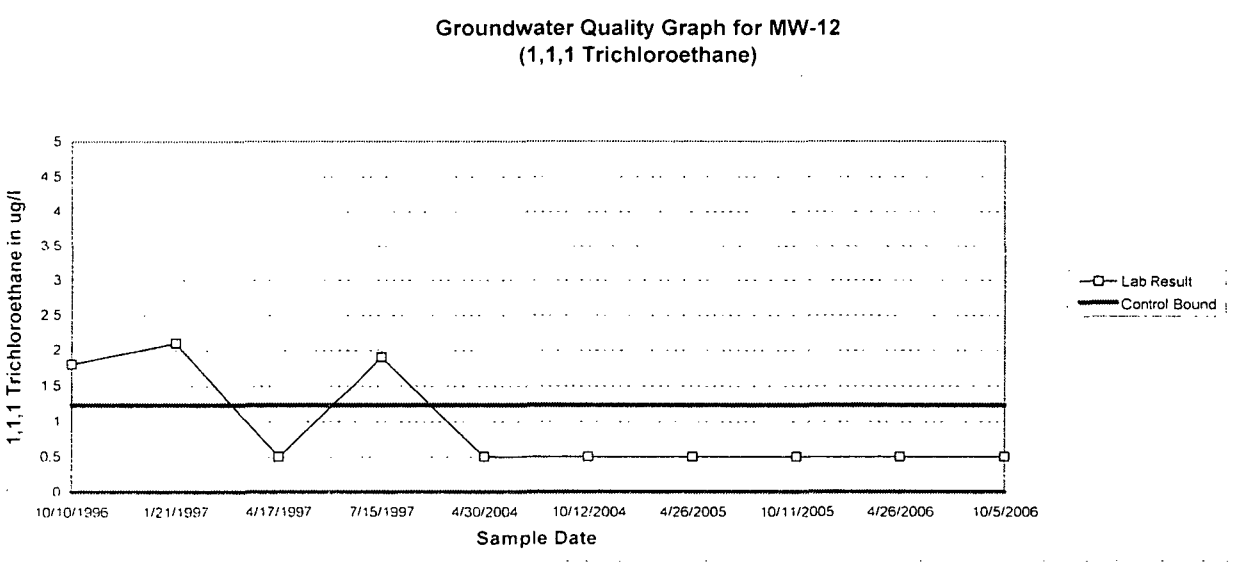


NOTE.
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

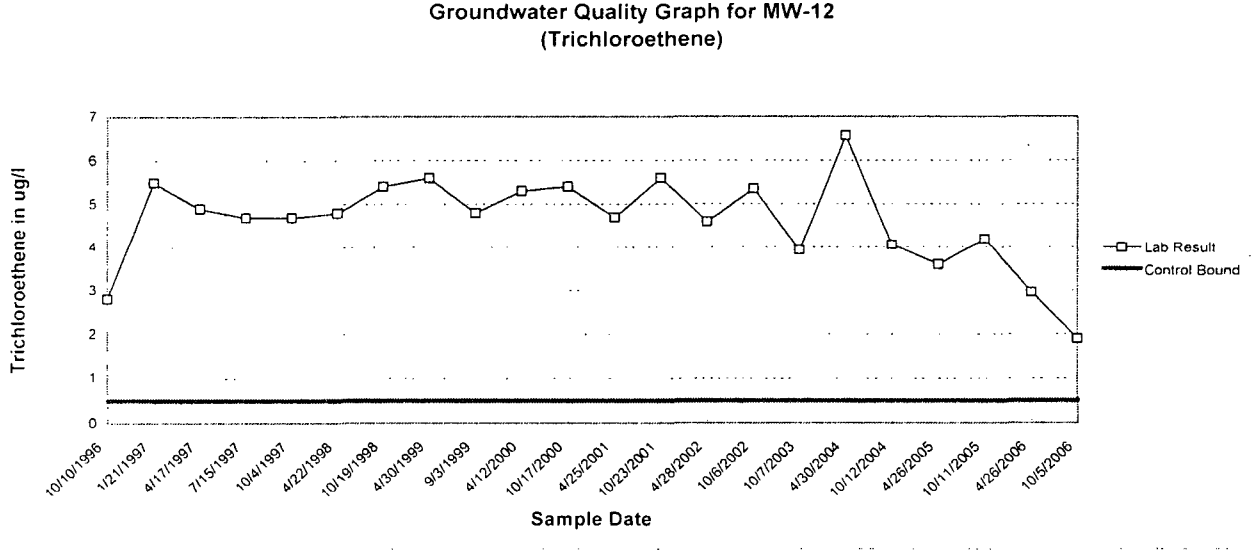


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

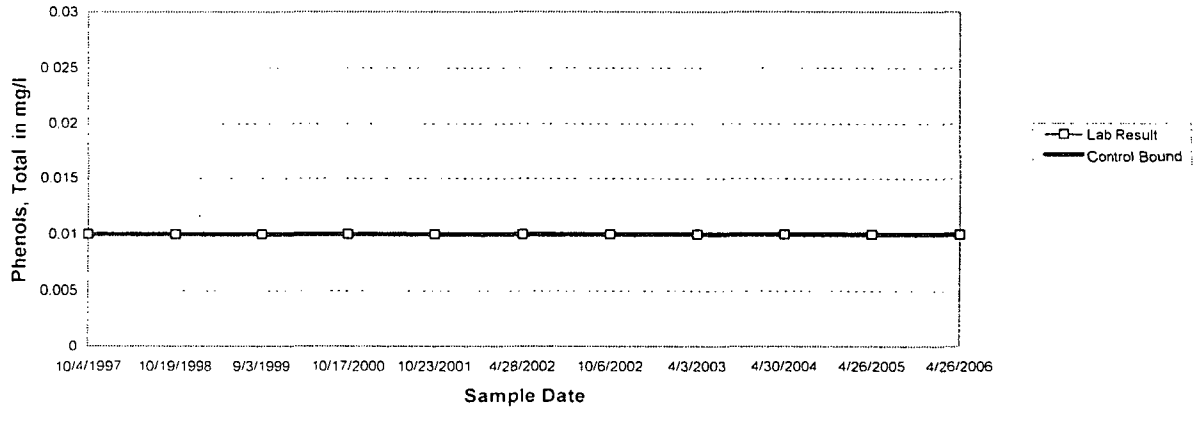


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

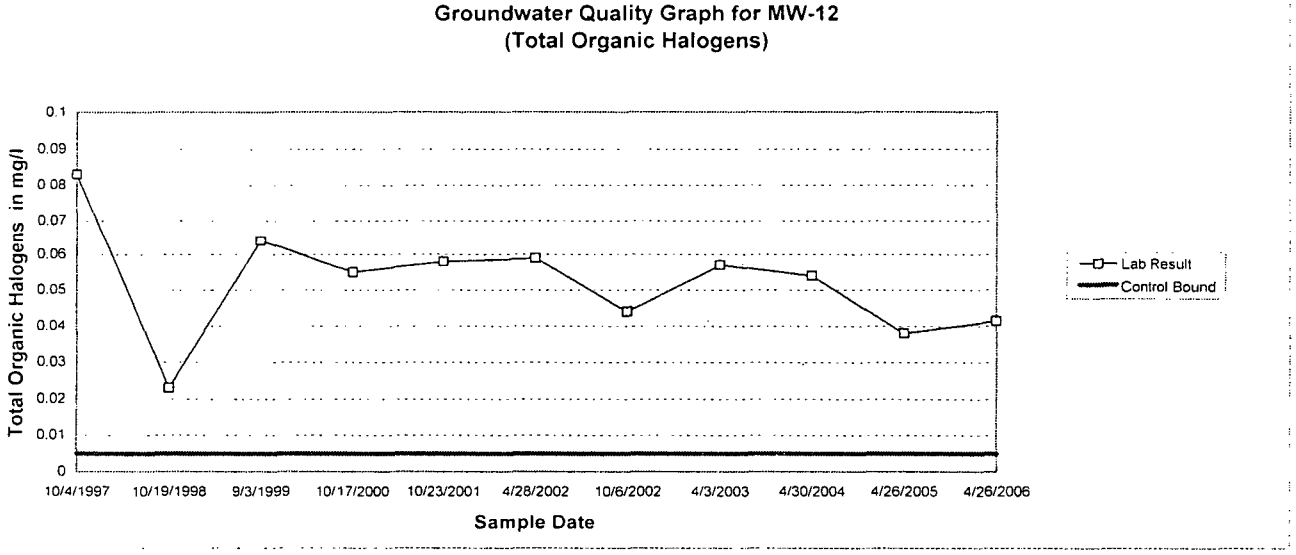


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

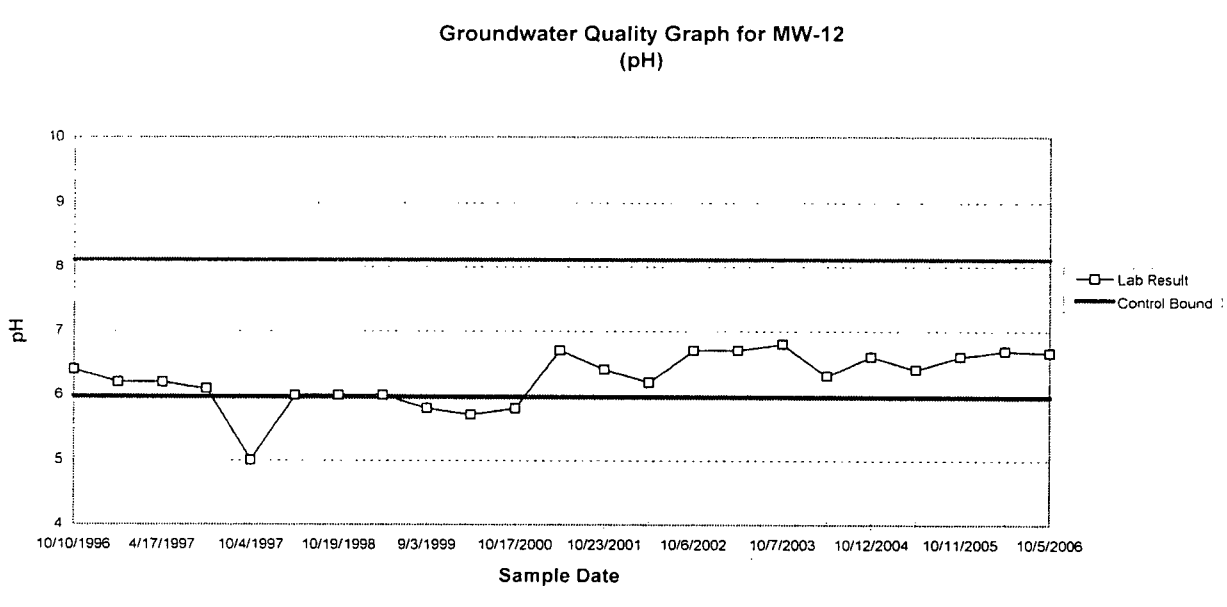


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

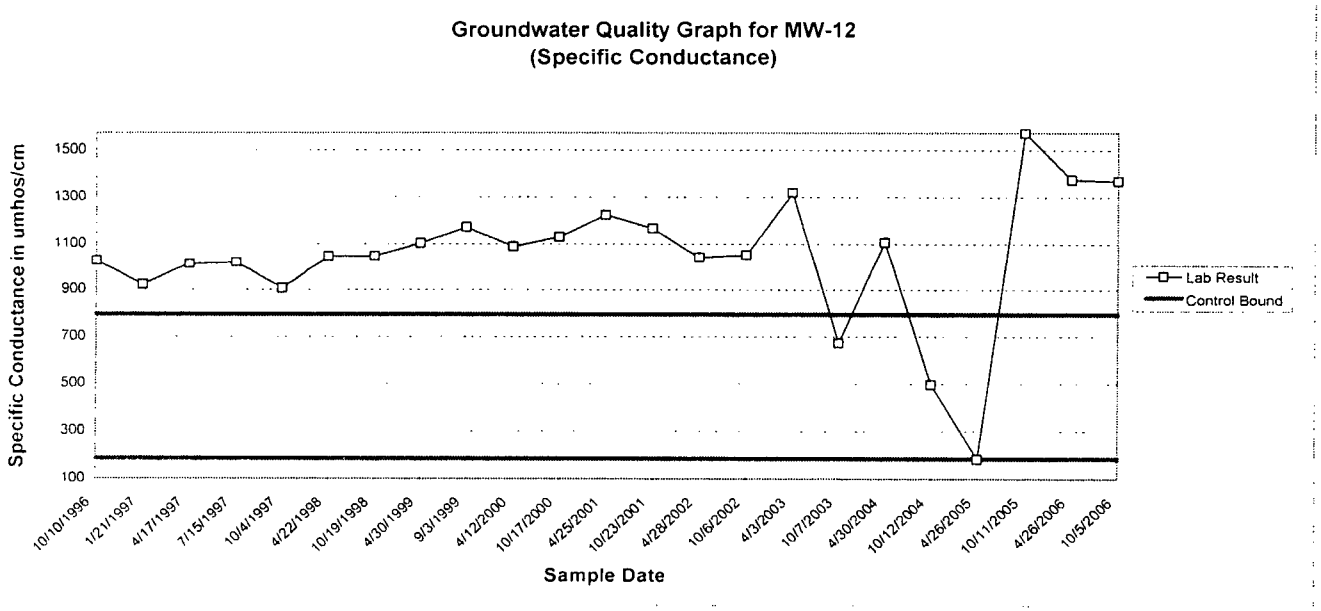


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-12

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-11* *(Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE										
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-11 Standard Deviation	MW-11 Mean	7/12/1996	10/10/1996	1/21/1997	4/17/1997	10/4/1997	4/22/1998	10/19/1998	4/30/1999	9/3/1999	4/12/2000	10/17/2000
Laboratory Parameters															
Chloride (mg/l)	4.823	0.634	13.484	24.49	19	19	22	20	28	20.2	32	37	33	6.4	5.5
Chemical Oxygen Demand (mg/l)	8.202	0.000	4.576	4.36	5.7	5.2	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**
Ammonia Nitrogen (mg/l)	0.100	0.100	0.035	0.11	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.740	0.21	3.6	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Benzene (µg/l)	0.250	0.250	0.116	0.31	**0.5**	**0.5**	**0.25**	**0.25**	-	-	-	-	-	-	**0.25**
1,2-Dichloroethane (µg/l)	0.404	0.051	0.106	0.24	**0.5**	**0.2**	**0.2**	**0.2**	-	-	-	-	-	-	**0.2**
1,1-Dichloroethene (µg/l)	1.000	1.000	0.274	0.80	**0.5**	**0.5**	**1.0**	**1.0**	-	-	-	-	-	-	-
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.300	0.65	**0.5**	1.1	**0.5**	**0.5**	-	-	-	-	-	-	-
Trichloroethene (µg/l)	0.500	0.500	0.000	0.50	**0.5**	**0.5**	**0.5**	**0.5**	-	-	-	-	-	-	**0.5**
Phenols, Total (mg/l)	0.010	0.010	0.000	0.01	-	-	-	-	**0.01**	-	**0.01**	-	**0.01**	-	**0.01**
Total Organic Halogens (mg/l)	0.005	0.005	0.003	0.01	-	-	-	-	**0.005**	-	0.015	-	0.011	-	**0.005**
Field Parameters															
pH	8.1	6.0	0.306	6.92	6.6	6.8	6.8	6.6	6.8	6.7	6.7	6.5	6.5	7.1	6.9
Specific Conductance (µs/cm)	793	183	187.606	716.30	465	622	515	537	543	625	667	707	736	737	740

NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory quantitative limit for parameters not detected.
3) One-half of the quantitative limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the quantitative limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-11* *(Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE											
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-11 Standard Deviation	MW-11 Mean	4/25/2001	10/23/2001	4/28/2002	10/6/2002	4/3/2003	10/7/2003	4/30/2004	10/12/2004	4/26/2005	10/11/2005	4/26/2006	10/5/2006
Laboratory Parameters																
Chloride (mg/l)	4.823	0.634	13.484	24.49	12.9	16.0	18.0	18.8	12.3	15.8	23.4	44.9	56.3	50.5	38.2	14
Chemical Oxygen Demand (mg/l)	8.202	0.000	5.271	4.453	**2.5**	**2.5**	5.4	23	7.8	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	10.6
Ammonia Nitrogen (mg/l)	0.100	0.100	0.035	0.11	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	0.27	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.740	0.21	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	0.274	**0.05**
Benzene (µg/l)	0.250	0.250	0.116	0.31	**0.25**	**0.25**	-	-	-	**0.25**	-	-	-	-	-	-
1,2-Dichloroethane (µg/l)	0.404	0.051	0.106	0.24	**0.2**	**0.2**	-	-	-	**0.2**	-	-	-	-	-	-
1,1-Dichloroethene (µg/l)	1.000	1.000	0.274	0.80	-	-	-	-	-	**1.0**	-	-	-	-	-	-
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.300	0.65	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene (µg/l)	0.500	0.500	0.000	0.50	**0.5**	**0.5**	-	-	-	**0.5**	-	-	-	-	-	-
Phenols, Total (mg/l)	0.010	0.010	0.000	0.01	-	**0.01**	**0.01**	**0.01**	**0.01**	-	**0.01**	-	**0.01**	-	**0.01**	-
Total Organic Halogens (mg/l)	0.005	0.005	0.003	0.01	-	**0.005**	**0.005**	**0.005**	**0.005**	-	**0.005**	-	**0.005**	-	**0.005**	-
Field Parameters																
pH	8.1	6.0	0.3	6.9	7.1	7.2	6.3	7.3	7.2	7.5	6.8	7.1	7.1	7.2	7.09	7.2
Specific Conductance (µs/cm)	793	183	188	716	428	733	784	684	735	832	615	1266	658	989	882	975

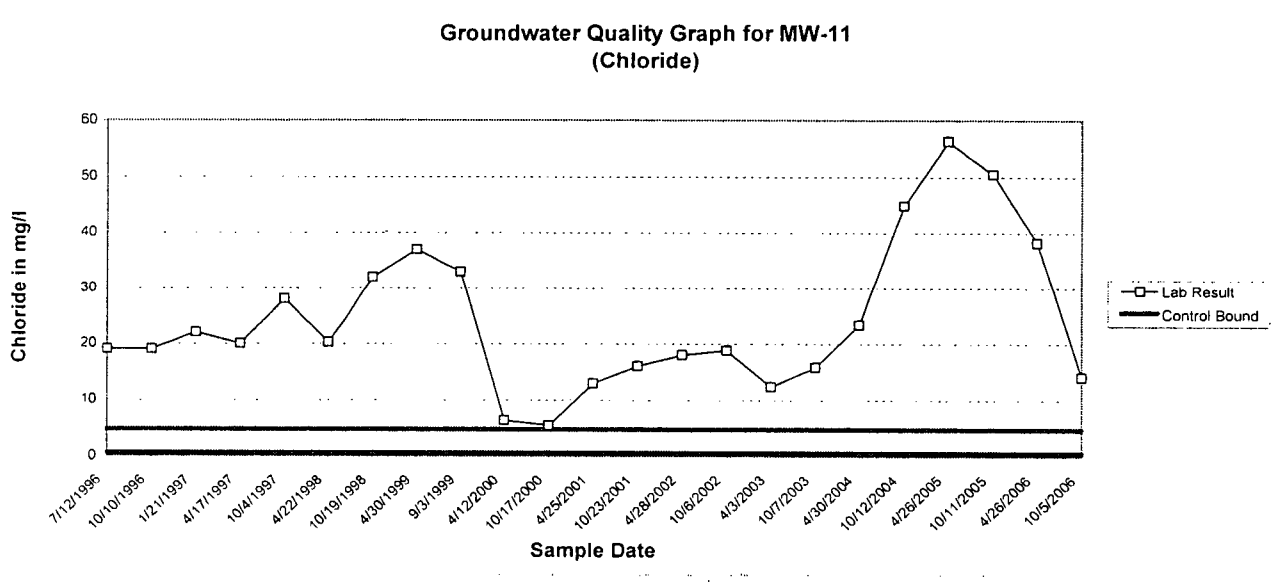
NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory quantitative limit for parameters not detected.
3) One-half of the quantitative limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the quantitative limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

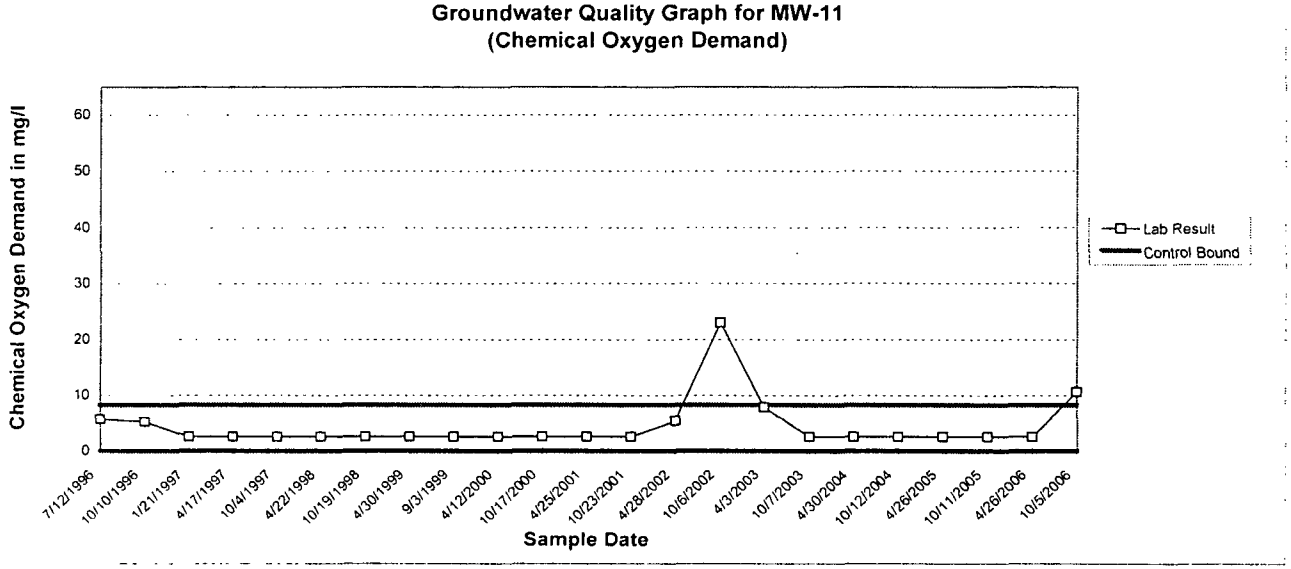


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

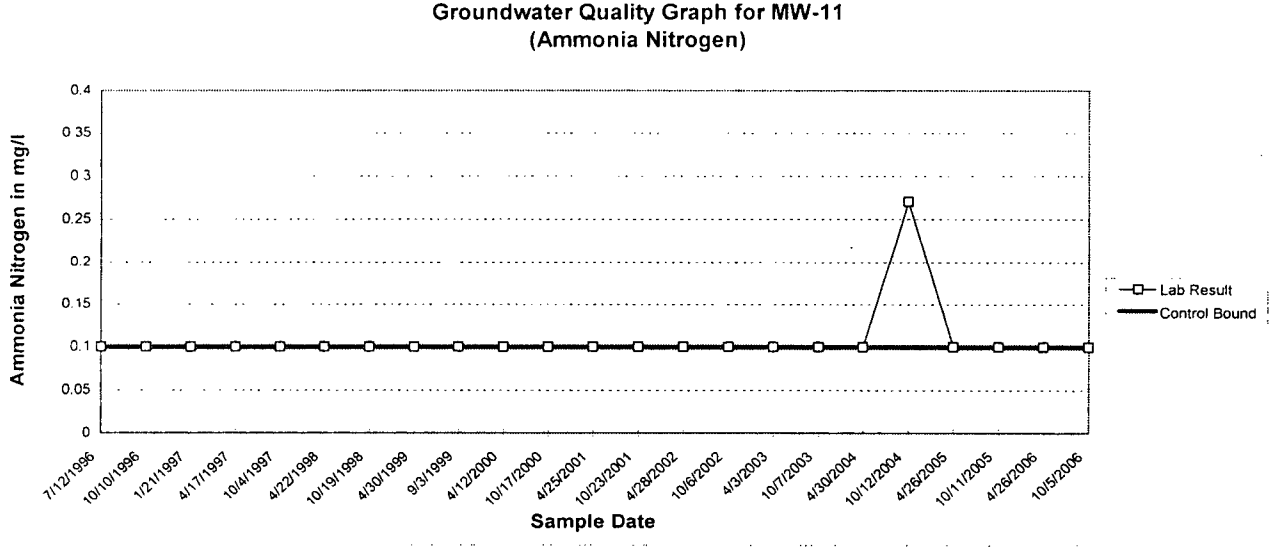


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



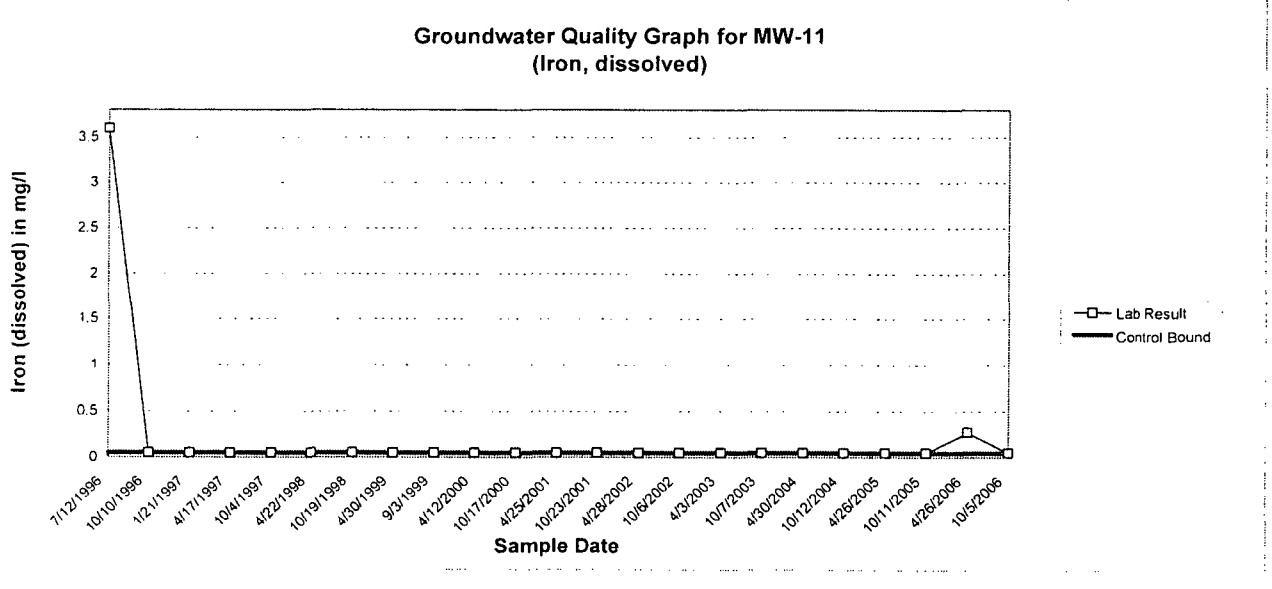
NOTE:

1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

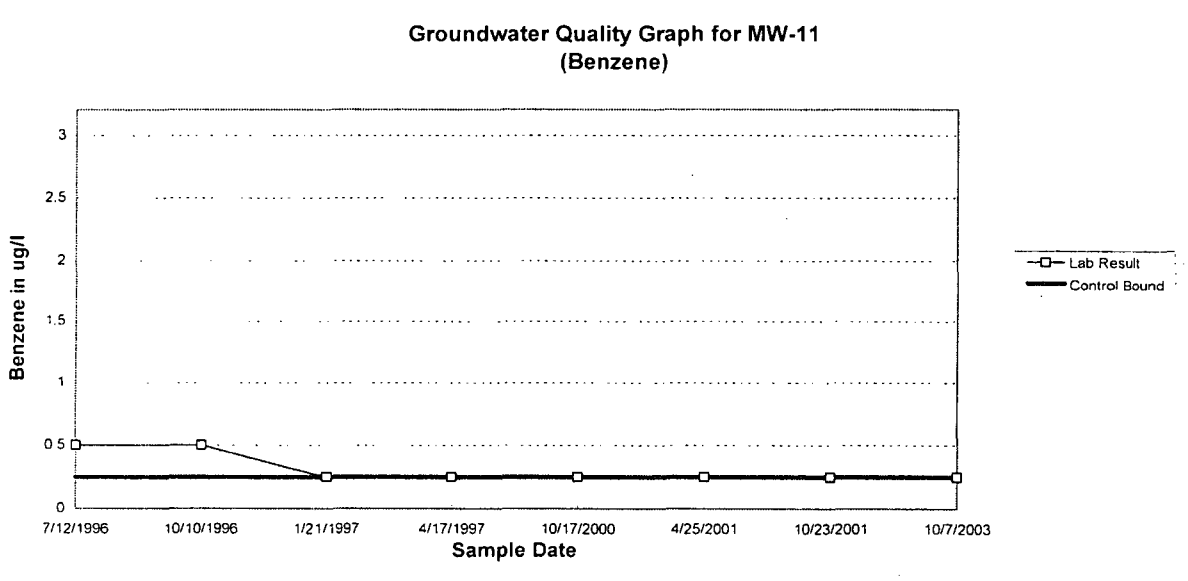


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

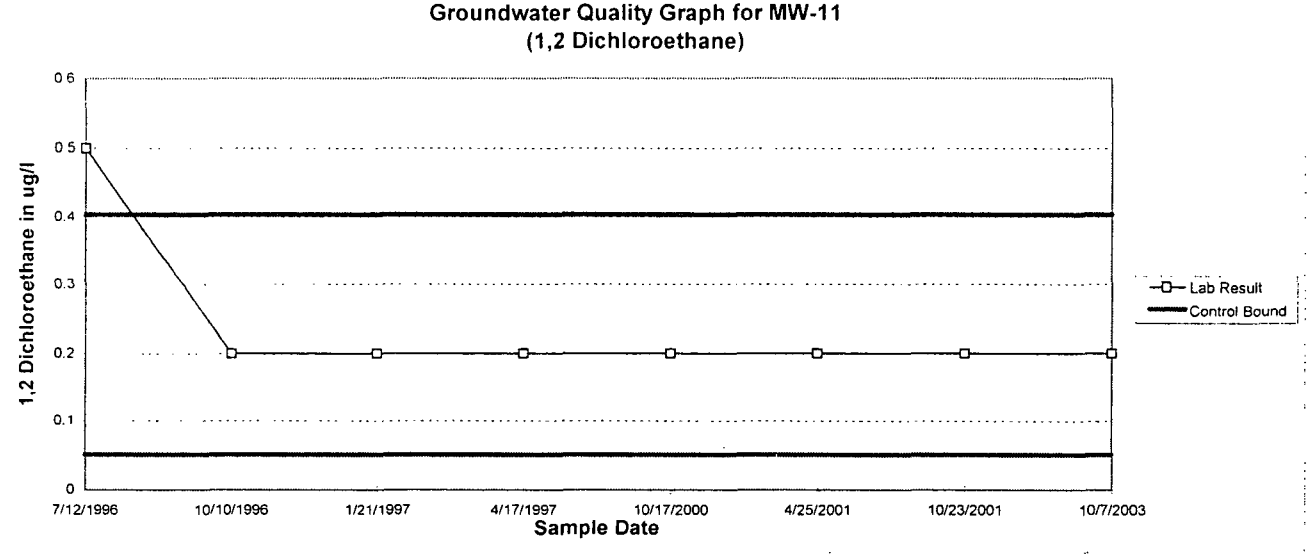


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

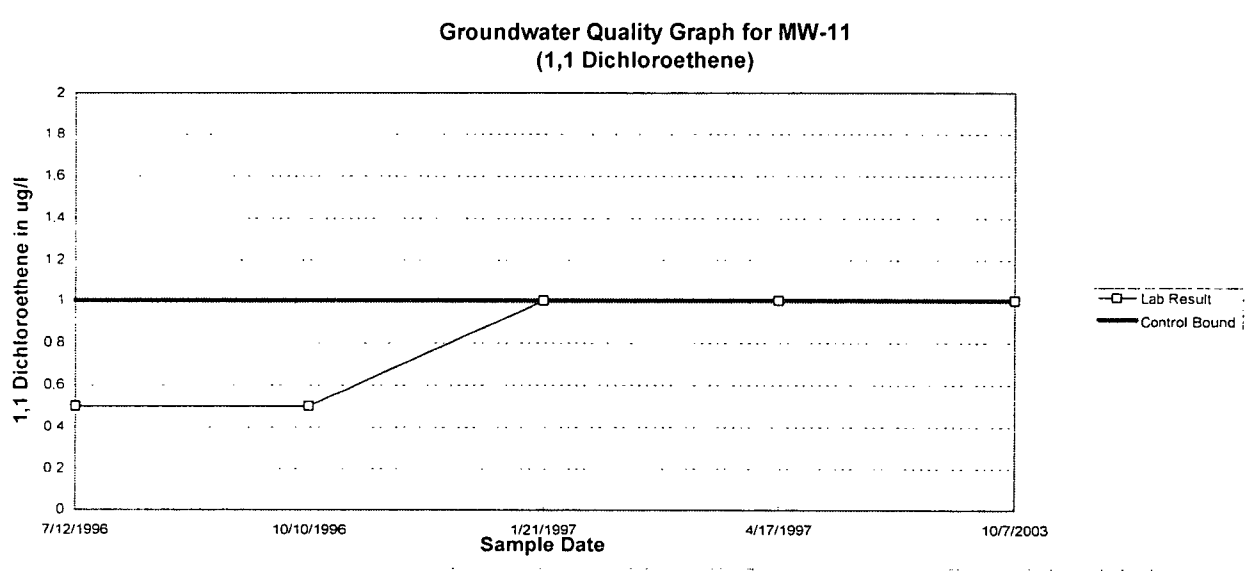


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

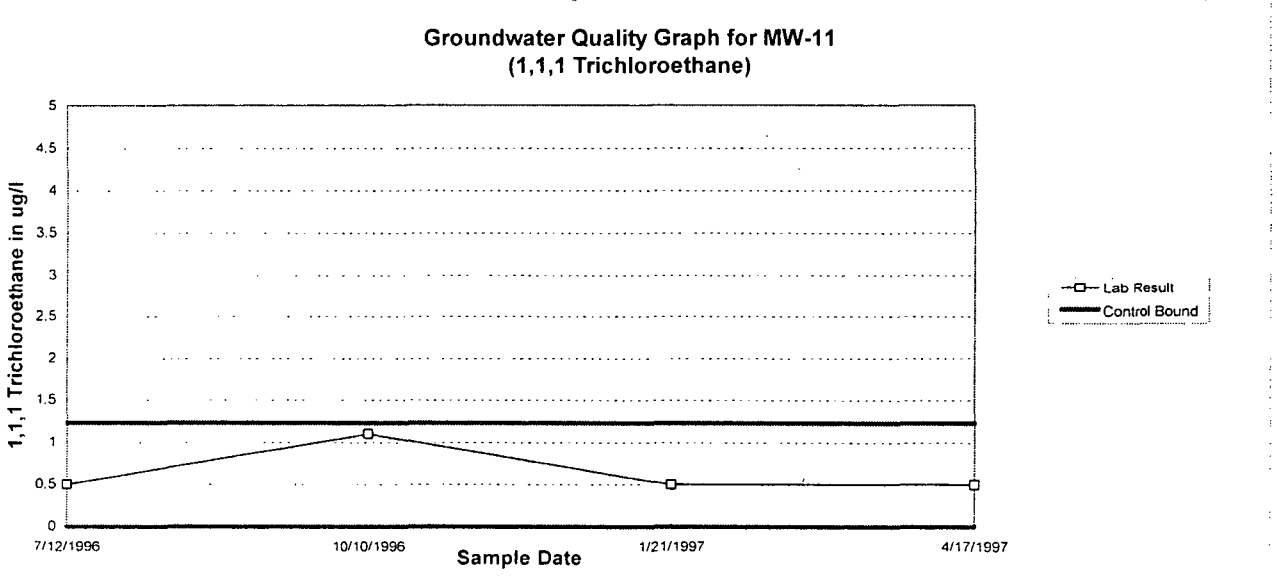


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

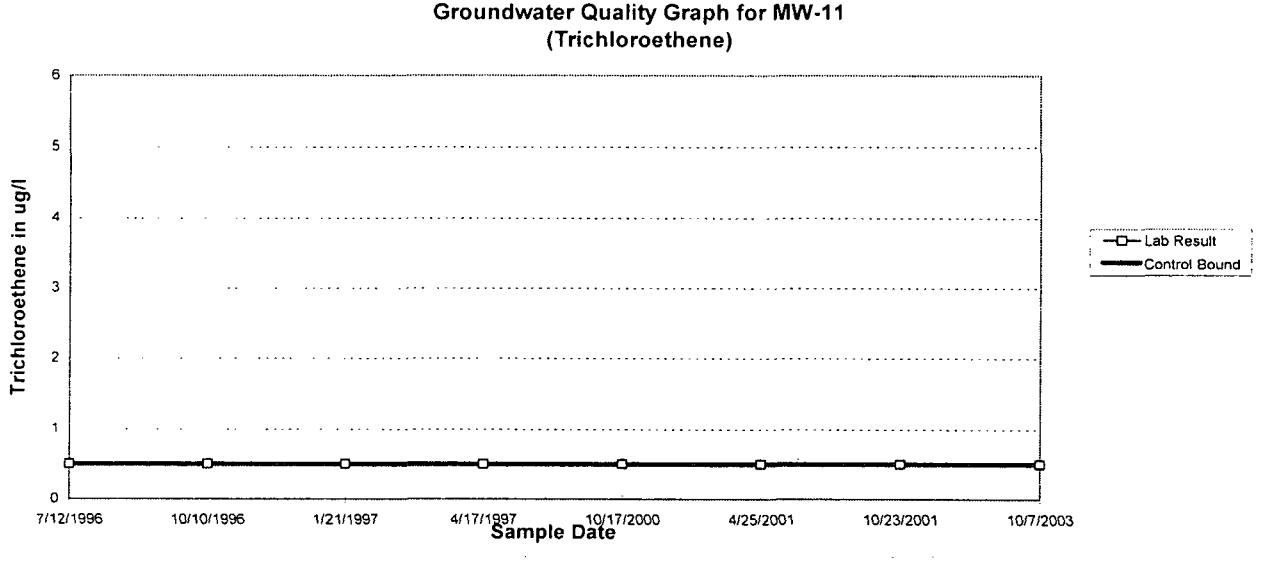


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

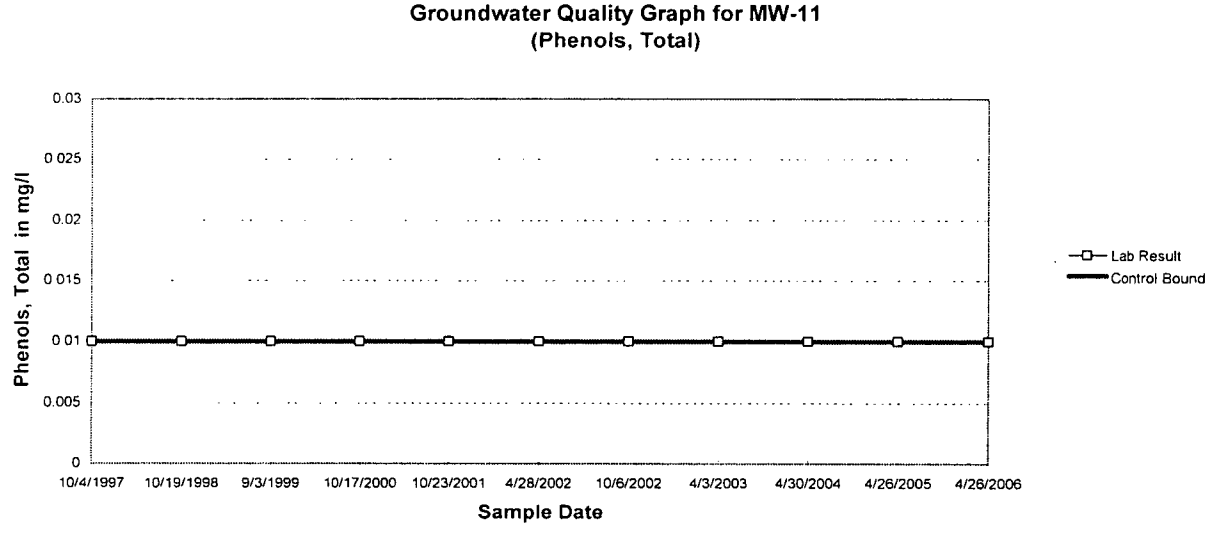


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

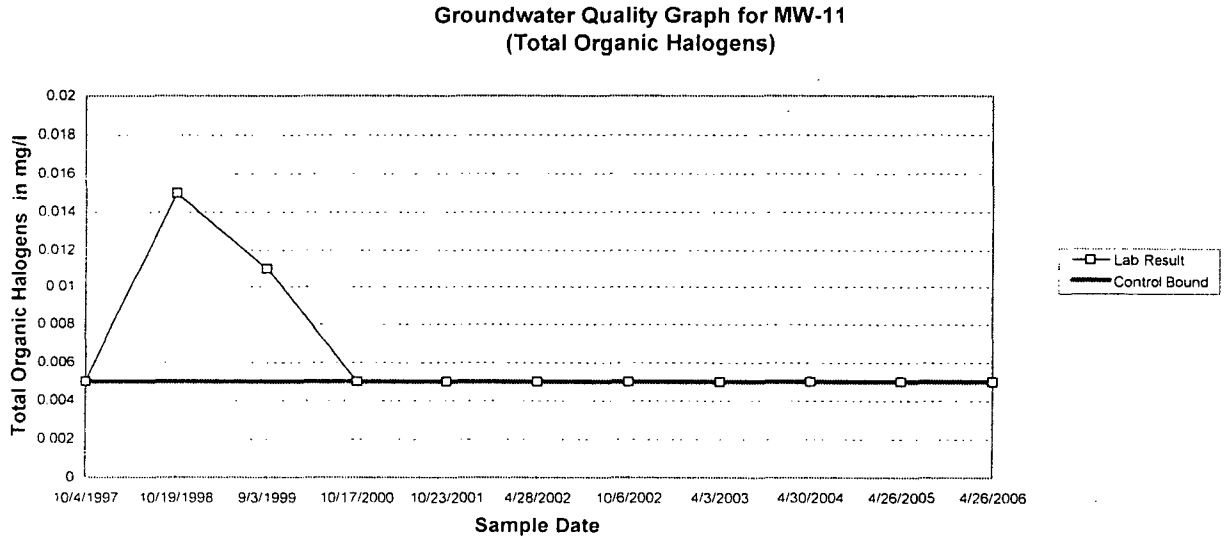


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

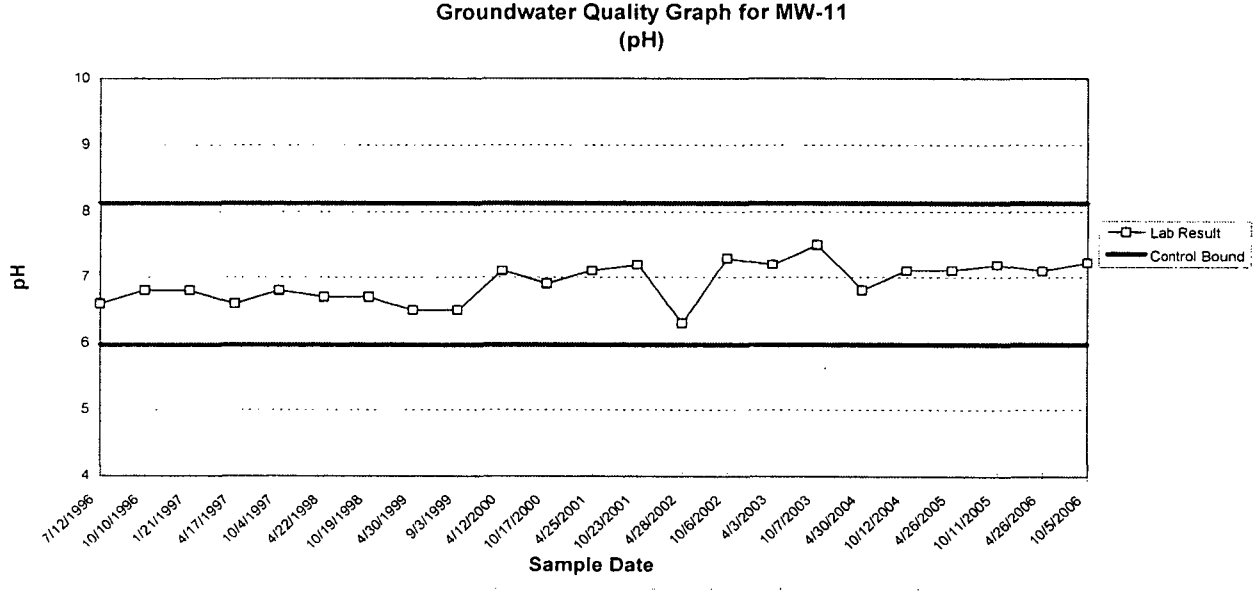


NOTE.
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

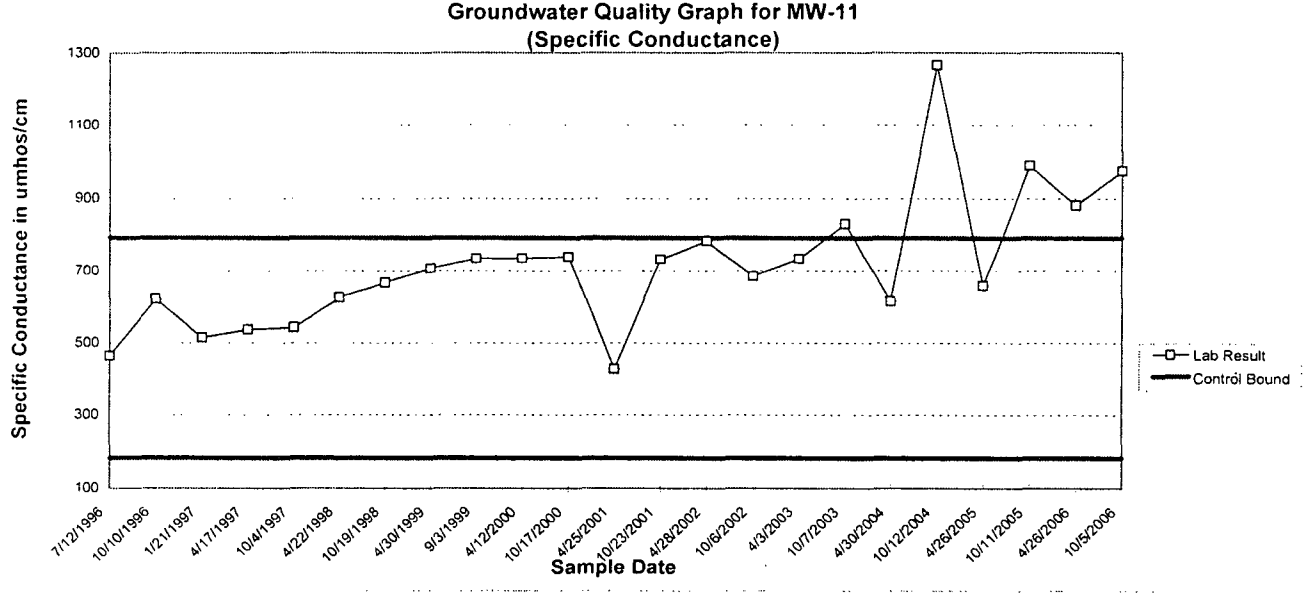


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-11

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-10* *(Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE										
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-10 Standard Deviation	MW-10 Mean	8/9/1996	10/10/1996	1/21/1997	4/17/1997	10/4/1997	4/22/1998	10/19/1998	4/30/1999	9/1/1999	4/12/2000	10/17/2000
Laboratory Parameters															
Chloride (mg/l)	4.823	0.634	4.307	20.82	13	14	15	22	19	19.6	20	21	21	18.6	19.7
Chemical Oxygen Demand (mg/l)	8.202	0.000	30.619	11.96	140.0	**2.5**	5.7	**2.5**	**2.5**	**2.5**	**2.5**	63	**2.5**	**2.5**	**2.5**
Ammonia Nitrogen (mg/l)	0.100	0.100	0.209	0.14	1.1	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.021	0.05	**0.05**	**0.05**	**0.05**	0.15	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Benzene (µg/l)	0.250	0.250	0.116	0.31	**0.5**	**0.5**	**0.25**	**0.25**	-	-	-	-	-	-	**0.25**
1,2-Dichloroethane (µg/l)	0.404	0.051	0.106	0.24	**0.5**	**0.2**	**0.2**	**0.2**	-	-	-	-	-	-	**0.2**
1,1-Dichloroethene (µg/l)	1.000	1.000	0.274	0.80	**0.5**	**0.5**	**1.0**	**1.0**	-	-	-	-	-	-	-
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.000	0.50	**0.5**	**0.5**	**0.5**	**0.5**	-	-	-	-	-	-	-
Trichloroethene (µg/l)	0.500	0.500	0.177	0.56	**0.5**	**0.5**	1.0	**0.5**	-	-	-	-	-	-	**0.5**
Phenols, Total (mg/l)	0.010	0.010	0.007	0.01	-	-	-	-	0.03	-	**0.01**	-	**0.01**	-	**0.01**
Total Organic Halogens (mg/l)	0.005	0.005	0.005	0.01	-	-	-	-	0.012	-	0.019	-	0.013	-	0.011
Field Parameters															
pH	8.1	6.0	0.404	6.77	8.1	6.7	6.8	6.5	6.5	6.4	6.5	6.4	6.3	6.3	6.4
Specific Conductance (µs/cm)	793	183	134.960	706.09	787	695	625	724	644	684	742	713	774	700	729

NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory quantitative limit for parameters not detected.
3) One-half of the quantitative limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the quantitative limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-10* *(Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE											
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-10 Standard Deviation	MW-10 Mean	4/25/2001	10/23/2001	4/28/2002	10/6/2002	4/3/2003	10/7/2003	4/30/2004	10/12/2004	4/26/2005	10/11/2005	4/26/2006	10/5/2006
Laboratory Parameters																
Chloride (mg/l)	4.823	0.634	4.307	20.82	16.7	18.6	17.9	17.8	23	23.6	24	26.2	28.1	28.7	26.2	25.1
Chemical Oxygen Demand (mg/l)	8.202	0.000	30.619	11.96	**2.5**	**2.5**	5.7	6.9	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	11.3
Ammonia Nitrogen (mg/l)	0.100	0.100	0.209	0.14	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.021	0.05	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Benzene (µg/l)	0.250	0.250	0.116	0.31	**0.25**	**0.25**	-	-	-	**0.25**	-	-	-	-	-	-
1,2-Dichloroethane (µg/l)	0.404	0.051	0.106	0.24	**0.2**	**0.2**	-	-	-	**0.2**	-	-	-	-	-	-
1,1-Dichloroethene (µg/l)	1.000	1.000	0.274	0.80	-	-	-	-	-	**1.0**	-	-	-	-	-	-
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.000	0.50	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene (µg/l)	0.500	0.500	0.177	0.56	**0.5**	**0.5**	-	-	-	**0.5**	-	-	-	-	-	-
Phenols, Total (mg/l)	0.010	0.010	0.007	0.01	-	**0.01**	0.01	**0.01**	**0.01**	-	**0.01**	-	**0.01**	-	**0.0217**	-
Total Organic Halogens (mg/l)	0.005	0.005	0.005	0.01	-	**0.005**	0.005	0.012	**0.005**	-	**0.005**	-	**0.005**	-	**0.005**	-
Field Parameters																
pH	8.1	6.0	0.4	6.8	7.0	6.9	6.5	7.1	7.0	7.3	6.6	7.0	6.8	6.7	6.9	7.0
Specific Conductance (µs/cm)	793	183	135	706	570	740	463	645	753	550	693	532	575	1051	879	972

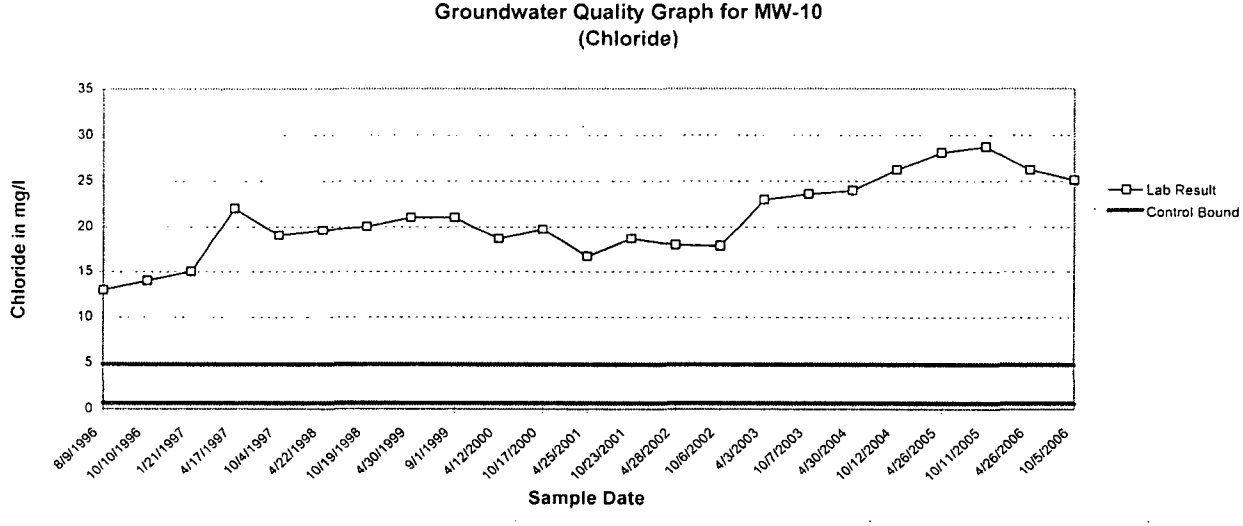
NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory detection limt (quantitative limit) for parameters not detected.
3) One-half of the quantitative limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the quantitative limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

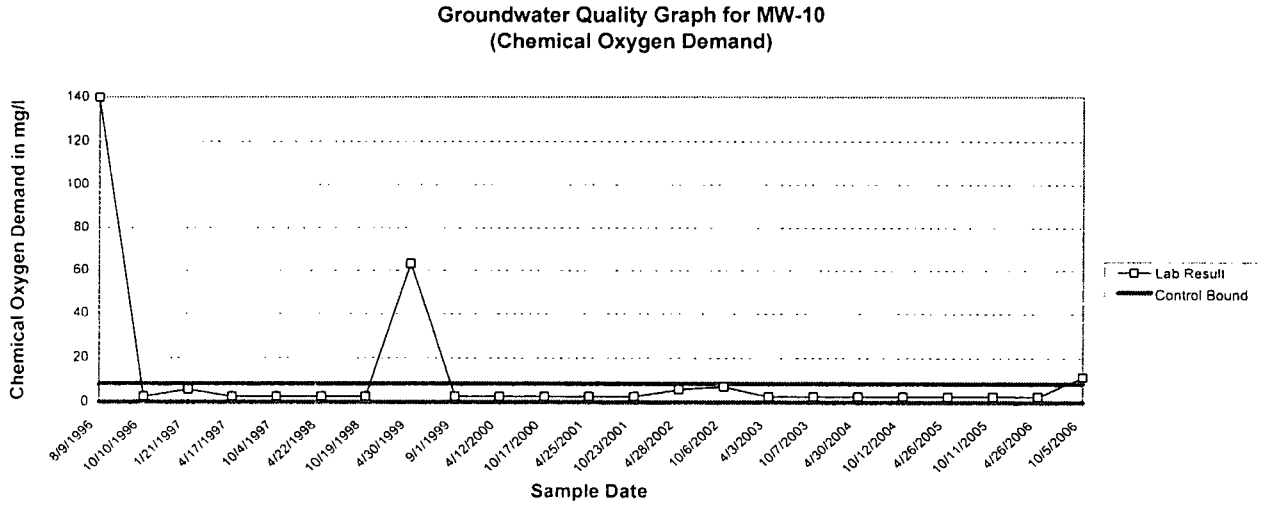


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

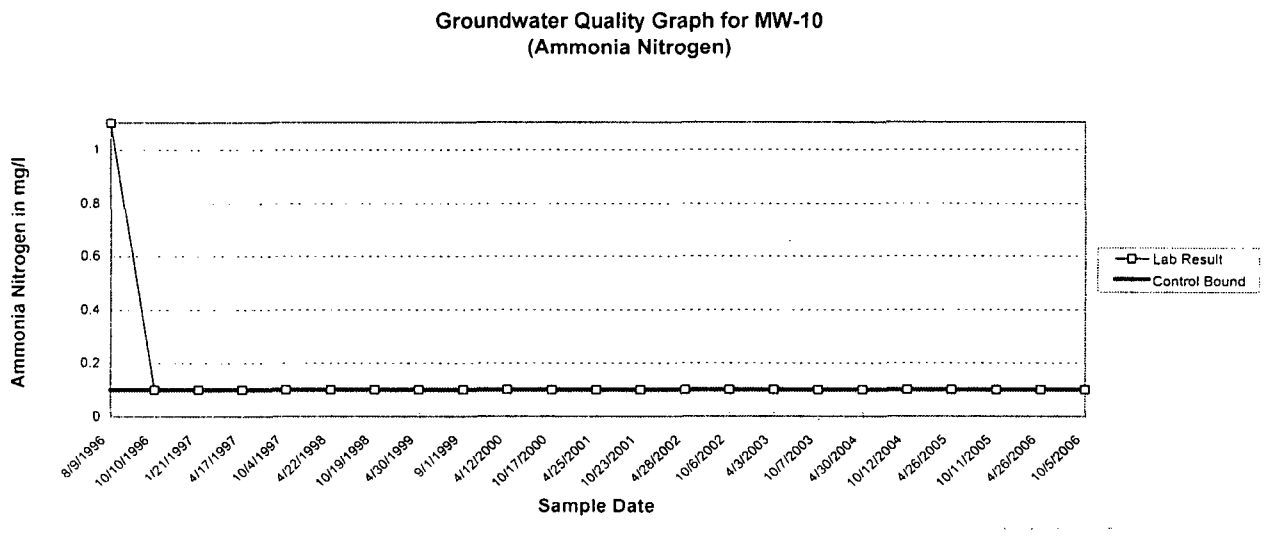


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



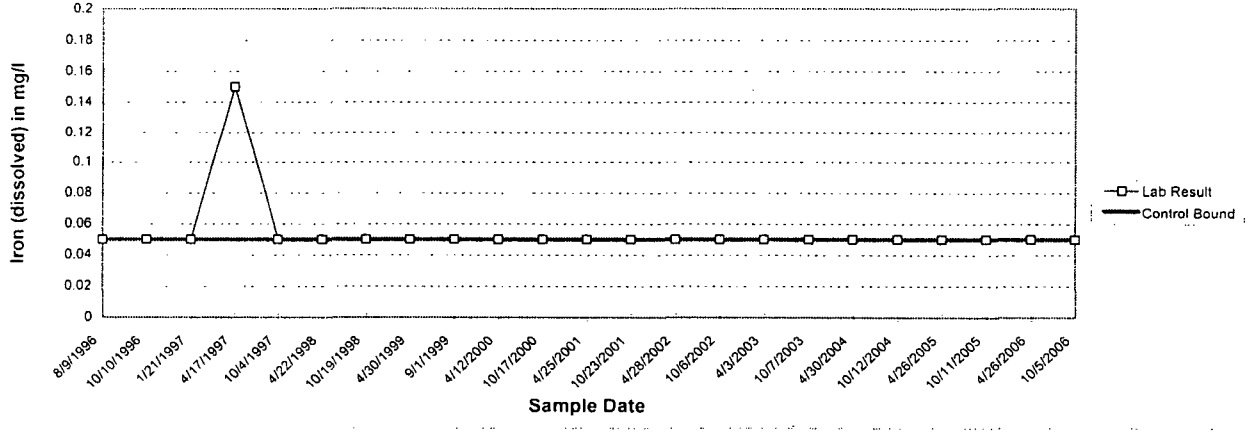
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-10
(Iron, dissolved)

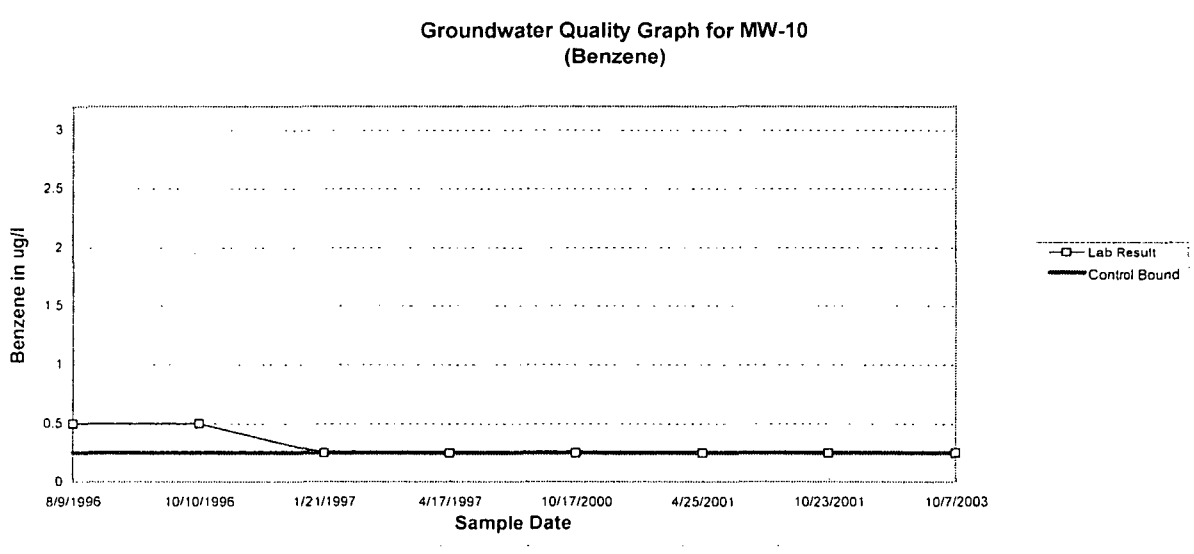


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

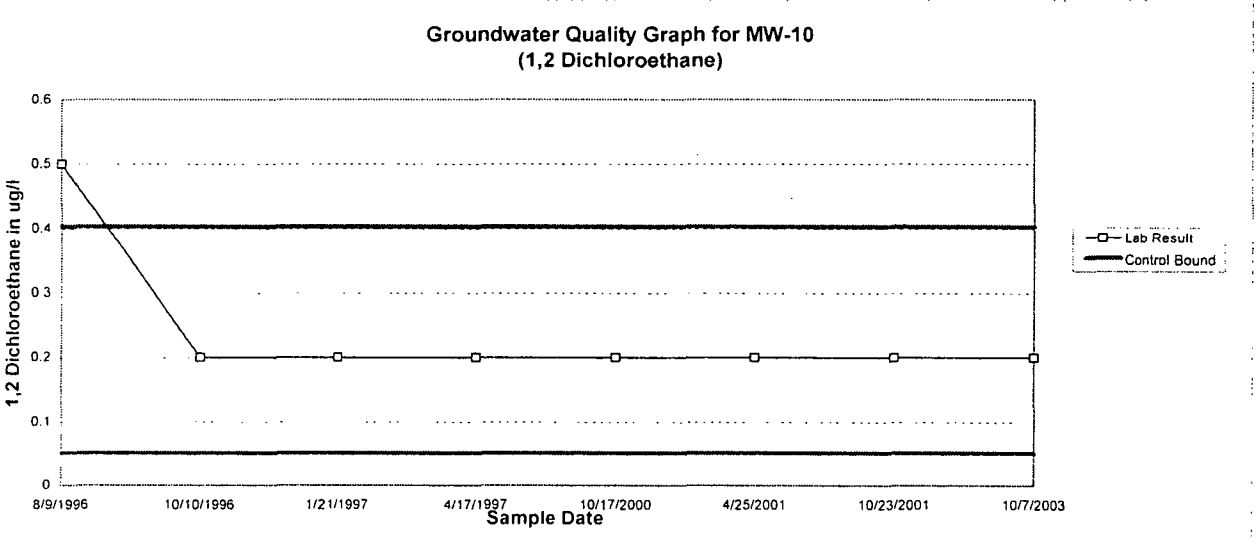


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

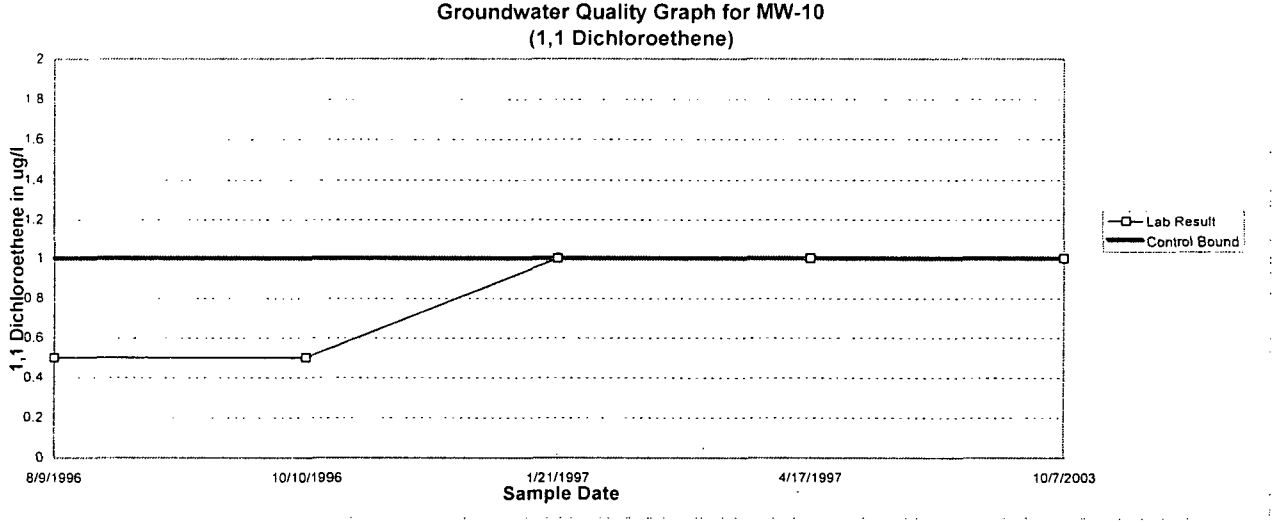


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

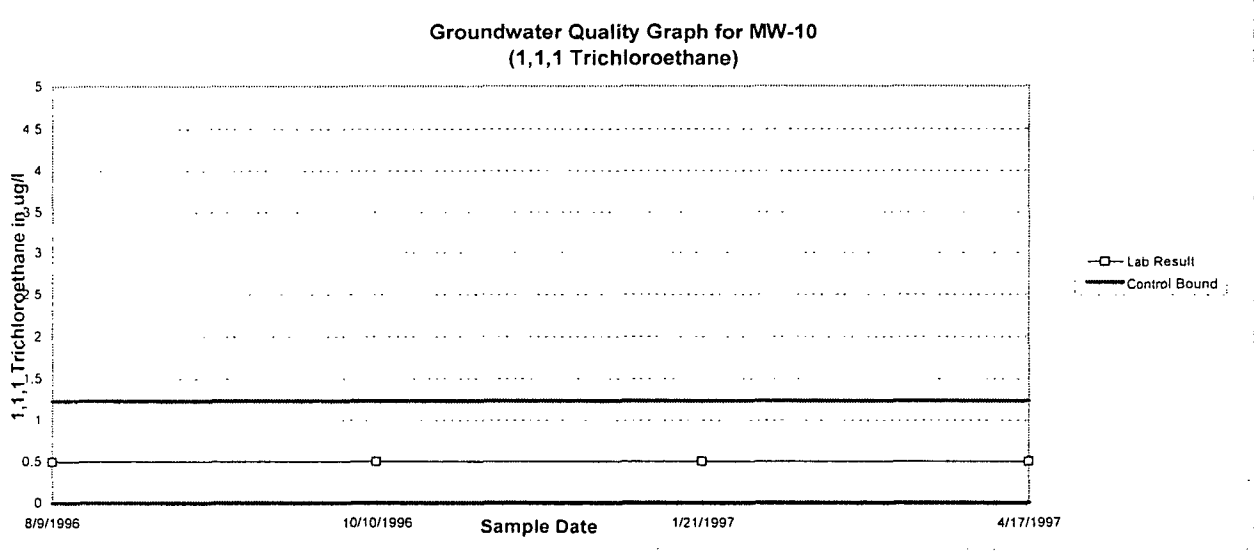


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

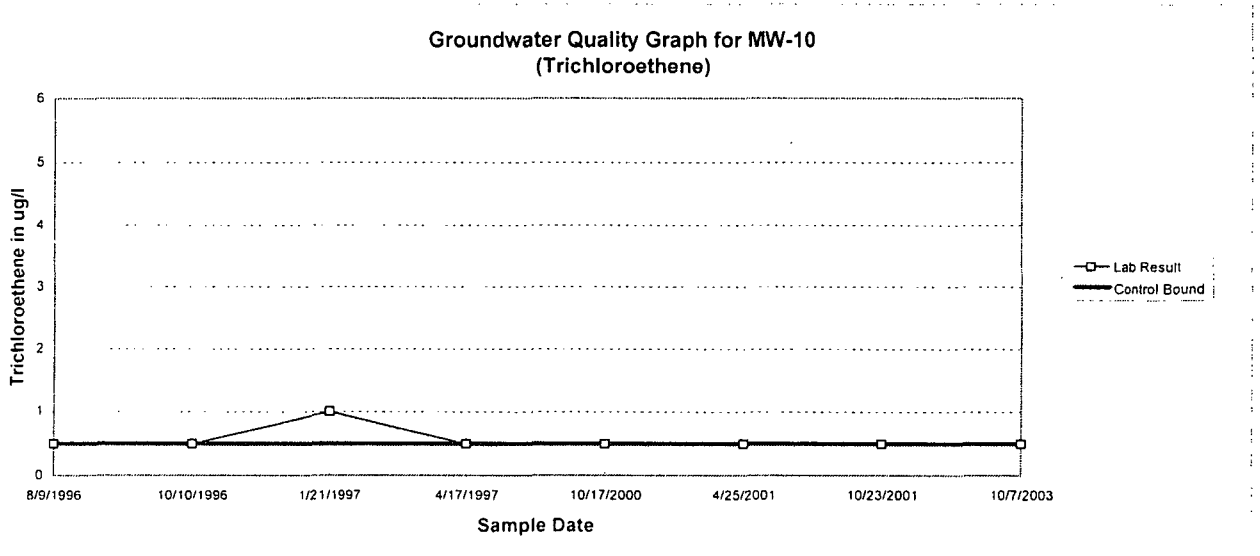


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

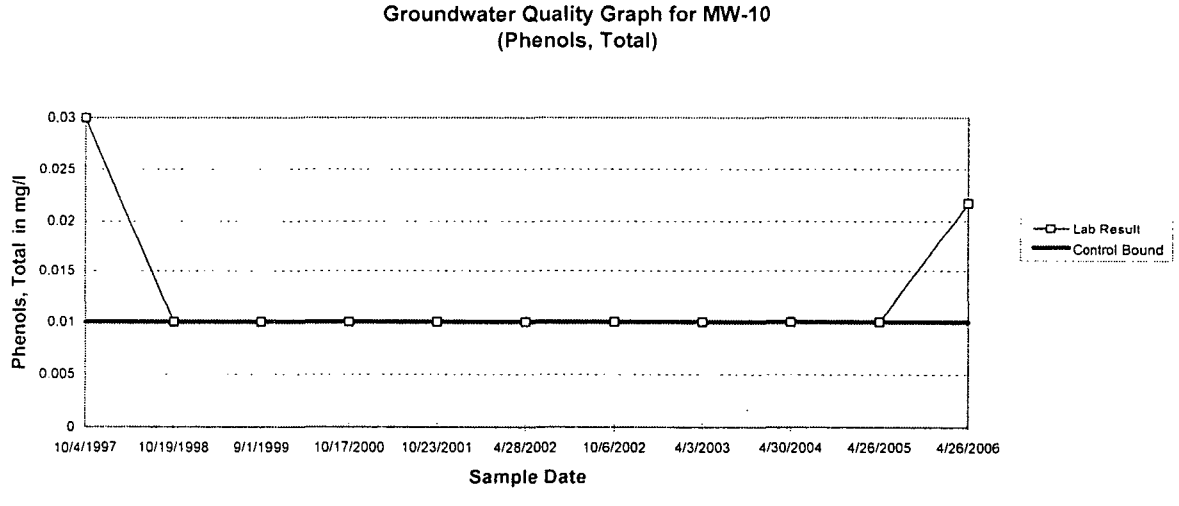


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

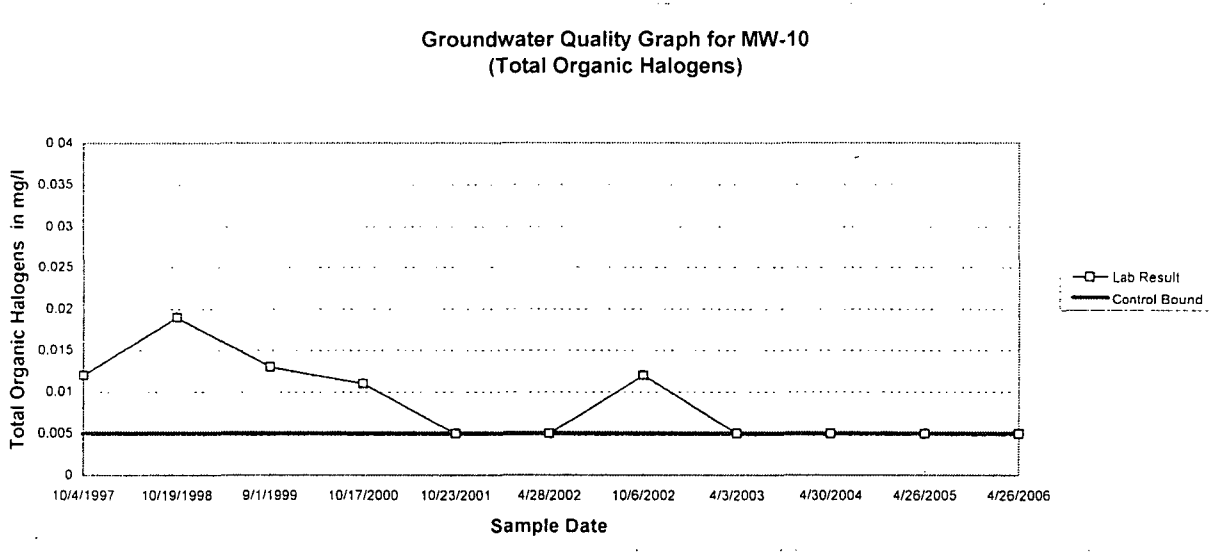


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

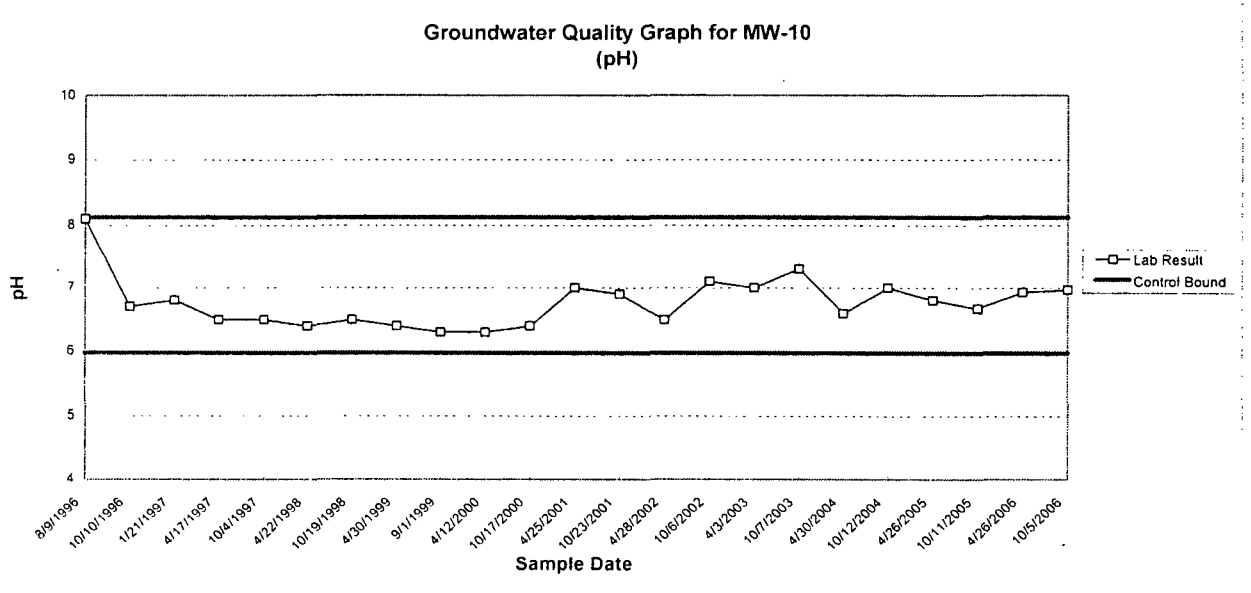


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

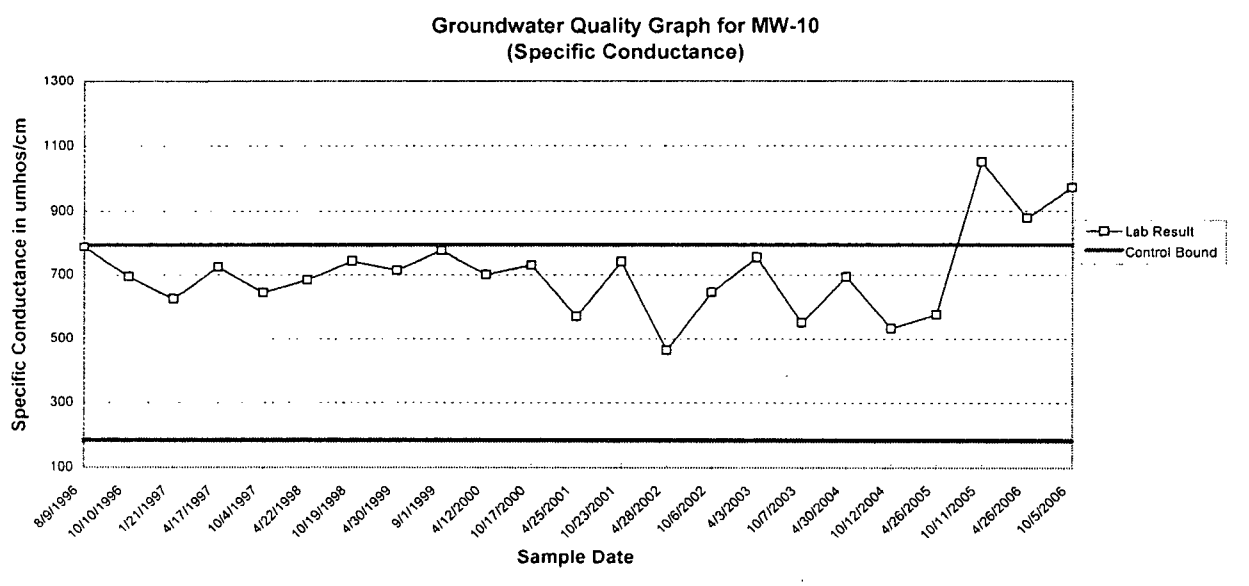


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-10

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-9* *(Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE										
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-9 Standard Deviation	MW-9 Mean	10/10/1996	1/21/1997	4/17/1997	7/15/1997	10/4/1997	4/22/1998	10/19/1998	4/30/1999	9/1/1999	4/12/2000	10/17/2000
Laboratory Parameters															
Chloride (mg/l)	4.823	0.634	1.332	9.769	8.7	10	11	12	11	11.3	11	9.7	10	-	-
Chemical Oxygen Demand (mg/l)	8.202	0.000	1.820	3.400	**2.5**	6.2	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	-	-
Ammonia Nitrogen (mg/l)	0.100	0.100	0.056	0.115	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	-	-
Iron, dissolved (mg/l)	0.050	0.050	0.000	0.050	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	-	-
Benzene (µg/l)	0.250	0.250	0.067	0.268	**0.5**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	-	-
1,2-Dichloroethane (µg/l)	0.404	0.051	0.154	0.326	0.55	**0.2**	**0.2**	**0.2**	0.54	**0.2**	0.4	0.47	**0.2**	-	-
1,1-Dichloroethene (µg/l)	1.000	1.000	0.139	0.962	**0.5**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	-	**1.0**	-	-
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.000	0.500	**0.5**	**0.5**	**0.5**	**0.5**	-	-	-	-	-	-	-
Trichloroethene (µg/l)	0.500	0.500	0.000	0.500	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	-	-
Phenols, Total (mg/l)	0.010	0.010	0.005	0.012	-	-	-	-	0.021	-	**0.01**	-	**0.01**	-	-
Total Organic Halogens (mg/l)	0.005	0.005	0.009	0.013	-	-	-	-	0.018	-	**0.005**	-	0.027	-	-
Field Parameters															
pH	8.1	6.0	0.305	6.449	6.5	6.5	6	6.3	6.3	6.3	6.3	6.1	6.1	-	-
Specific Conductance (µs/cm)	793	183	252.083	866.143	895	787	882	922	887	900	956	992	992	-	-

NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory quantitative limit for parameters not detected.
3) One-half of the quantitative limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the quantitative limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-9* *(Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE											
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-9 Standard Deviation	MW-9 Mean	4/25/2001	10/23/2001	4/28/2002	10/6/2002	4/3/2003	10/7/2003	4/30/2004	10/12/2004	4/26/2005	10/11/2005	4/26/2006	10/5/2006
Laboratory Parameters																
Chloride (mg/l)	4.823	0.634	1.332	9.769	-	-	-	-	-	-	-	8.9	7.9	8.4	8.07	8.8
Chemical Oxygen Demand (mg/l)	8.202	0.000	1.820	3.400	-	-	-	-	-	-	-	**2.5**	6.2	**2.5**	**2.5**	7.7
Ammonia Nitrogen (mg/l)	0.100	0.100	0.056	0.115	-	-	-	-	-	-	-	0.31	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.000	0.050	-	-	-	-	-	-	-	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Benzene (µg/l)	0.250	0.250	0.067	0.268	-	-	-	-	-	-	-	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
1,2-Dichloroethane (µg/l)	0.404	0.051	0.154	0.326	-	-	-	-	-	-	-	**0.2**	**0.2**	**0.2**	**0.5**	**0.5**
1,1-Dichloroethene (µg/l)	1.000	1.000	0.139	0.962	-	-	-	-	-	-	-	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.000	0.500	-	-	-	-	-	-	-	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Trichloroethene (µg/l)	0.500	0.500	0.000	0.500	-	-	-	-	-	-	-	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Phenols, Total (mg/l)	0.010	0.010	0.005	0.012	-	-	-	-	-	-	-	-	**0.01**	-	**0.01**	-
Total Organic Halogens (mg/l)	0.005	0.005	0.009	0.013	-	-	-	-	-	-	-	-	**0.005**	-	**0.01**	-
Field Parameters																
pH	8.1	6.0	0.3	6.4	-	-	-	-	-	-	-	6.9	6.5	7.0	6.7	6.84
Specific Conductance (µs/cm)	793	183	252	866	-	-	-	-	-	-	-	527	146	1128	1054	1058

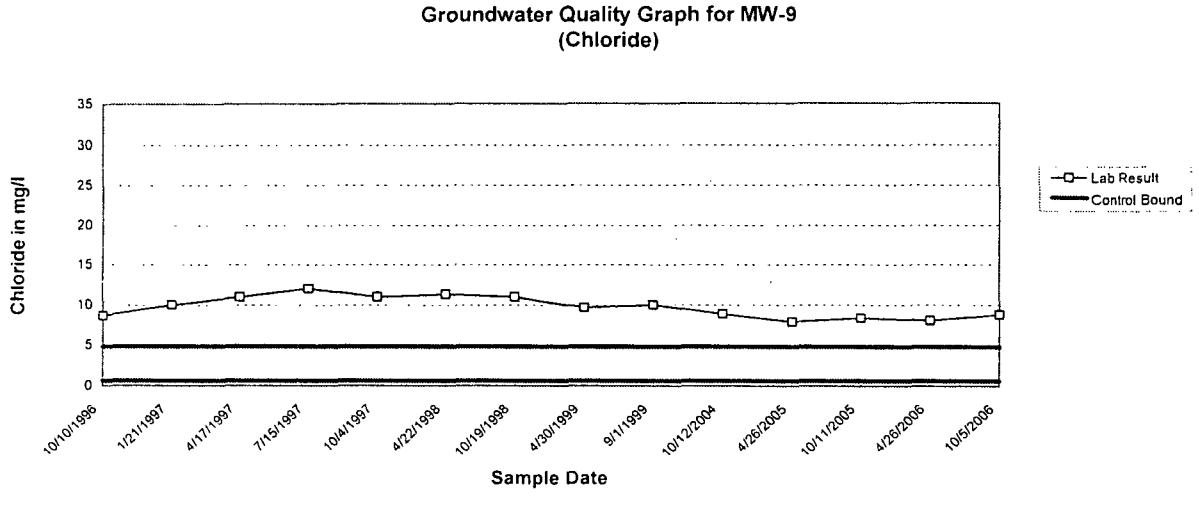
NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory quantitative limit for parameters not detected.
3) One-half of the quantitative limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the quantitative limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



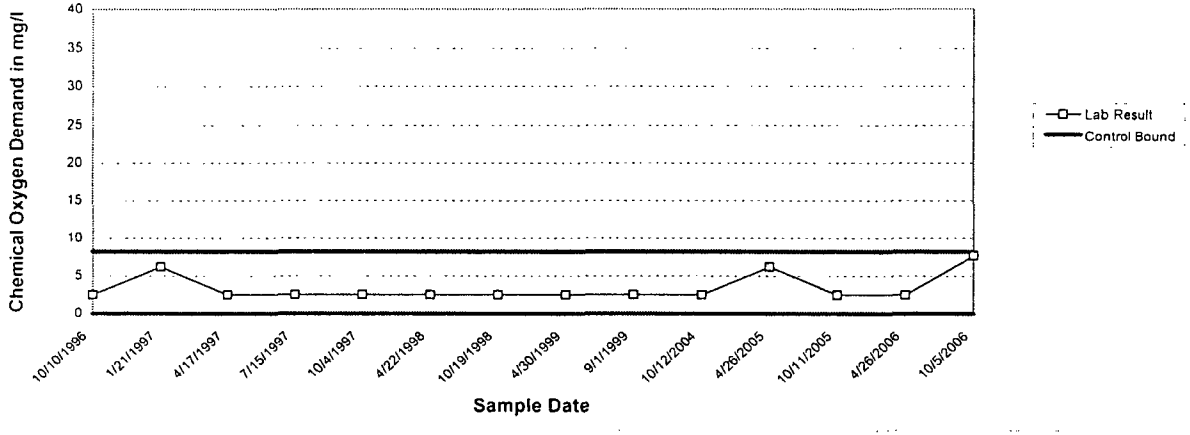
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-9
(Chemical Oxygen Demand)

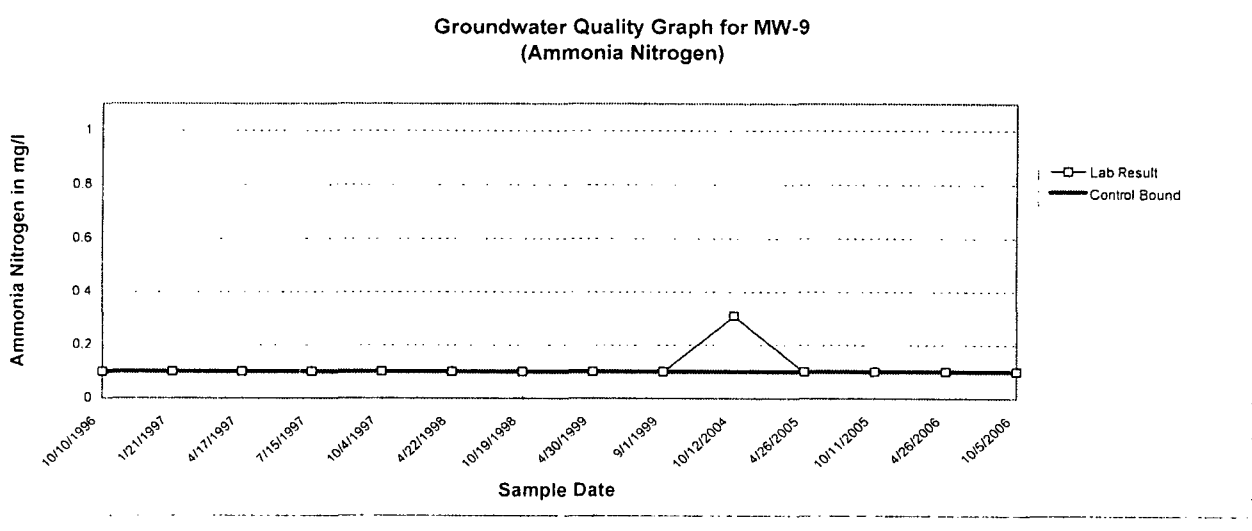


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

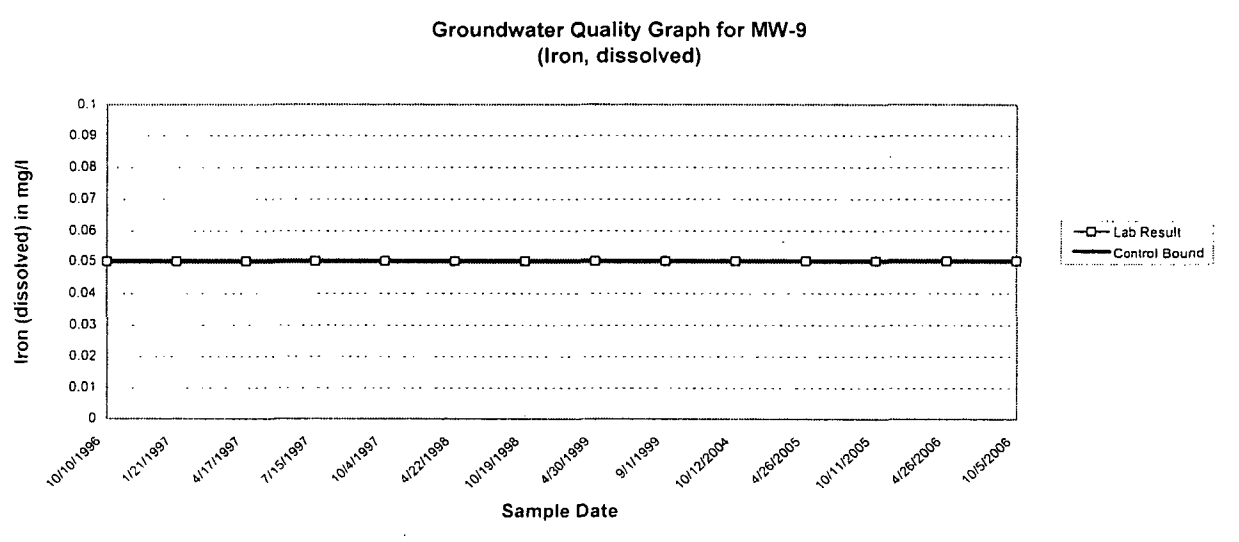


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

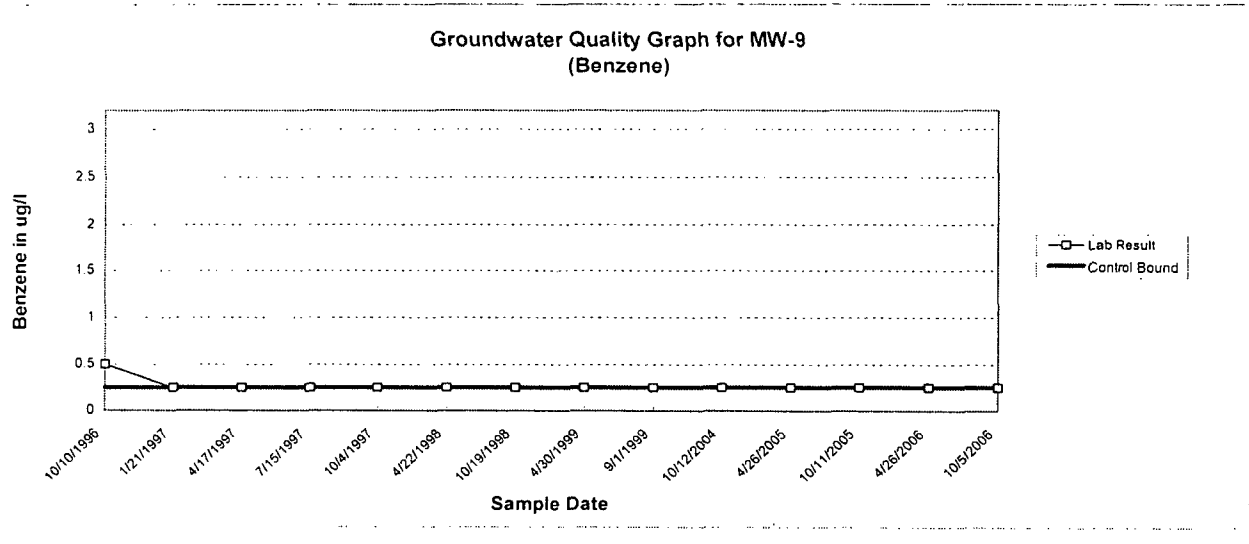


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

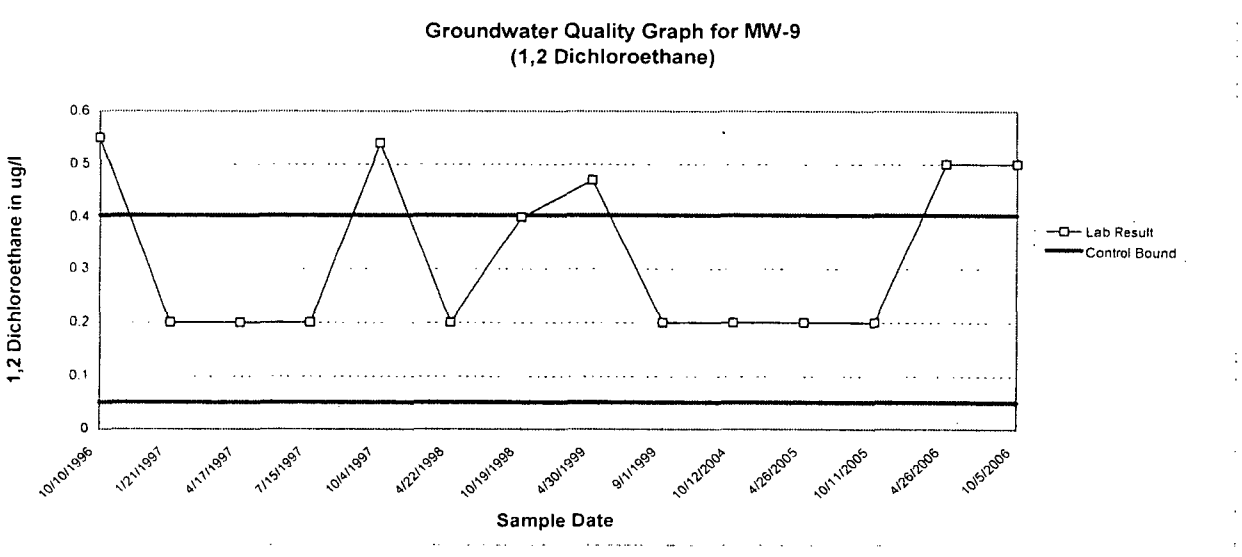


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

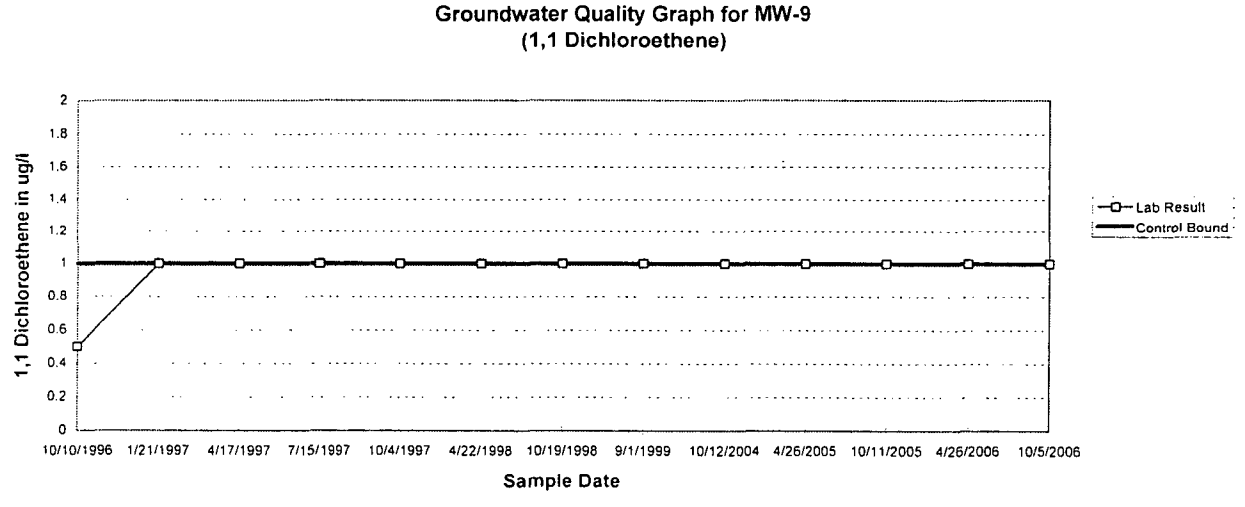


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

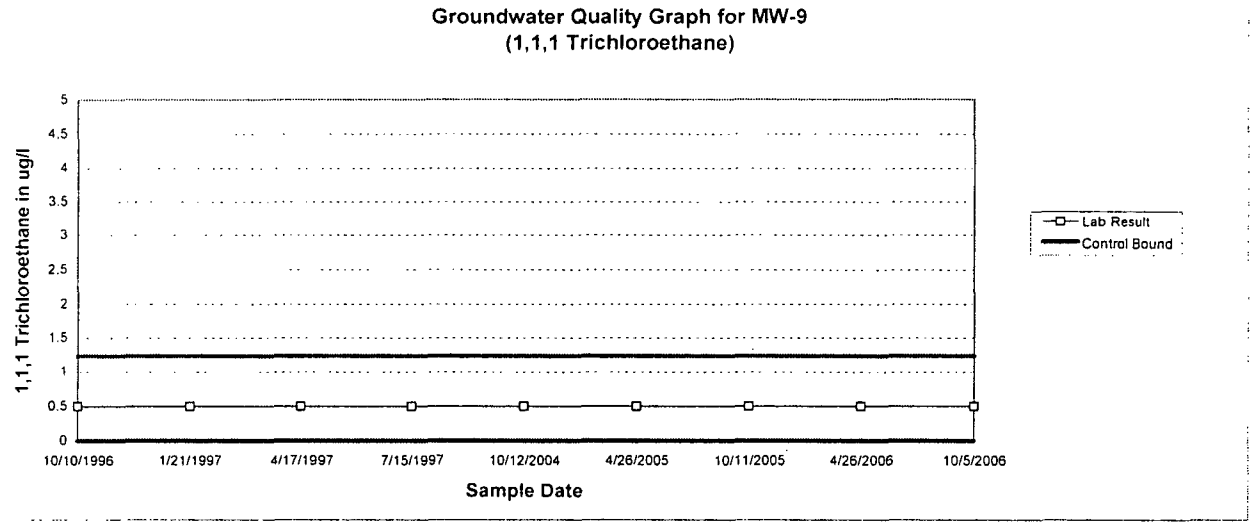


NOTE.
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

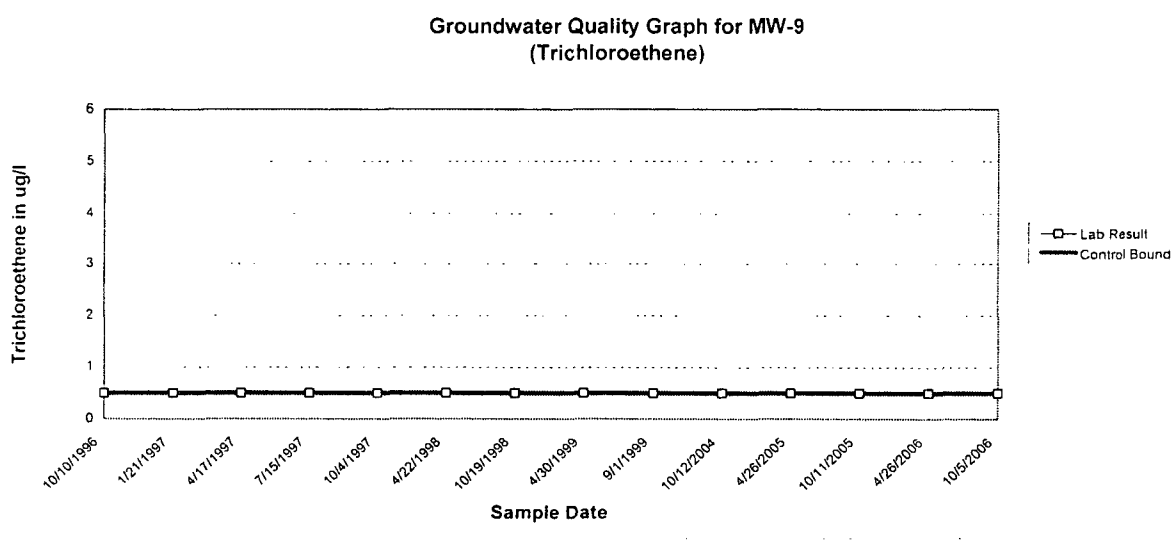


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

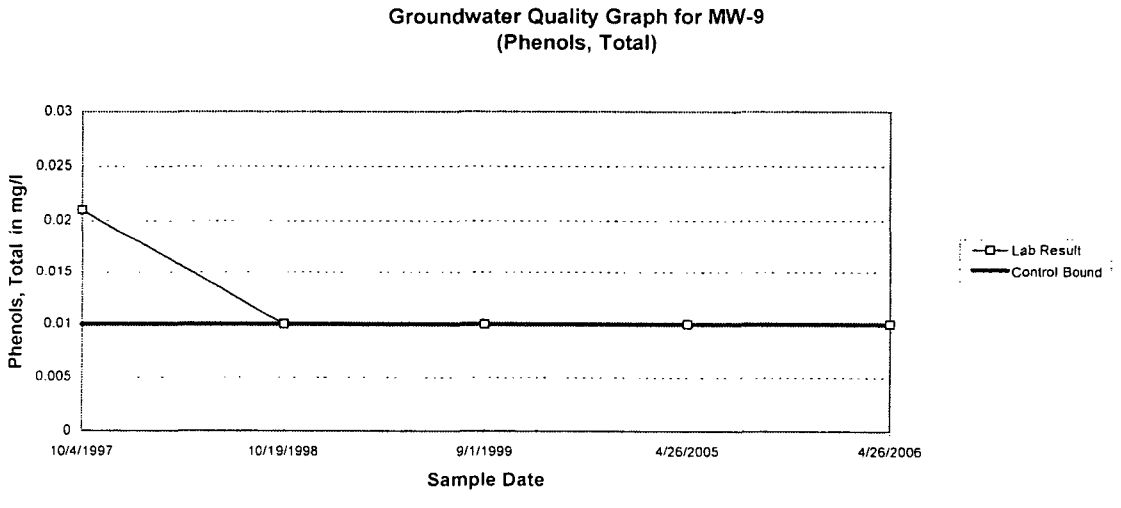


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

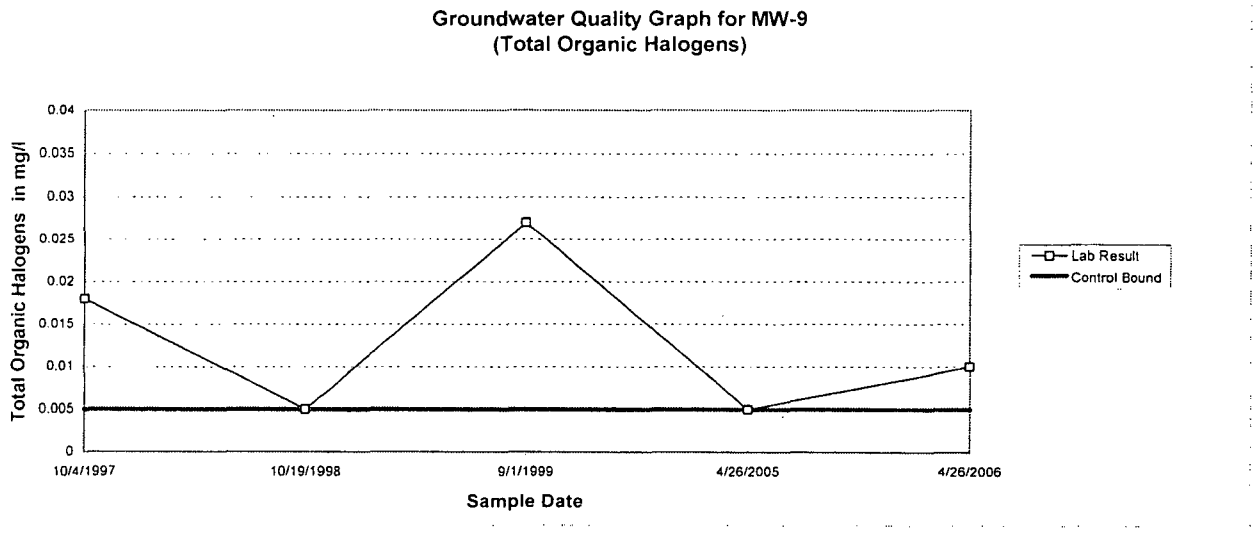


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

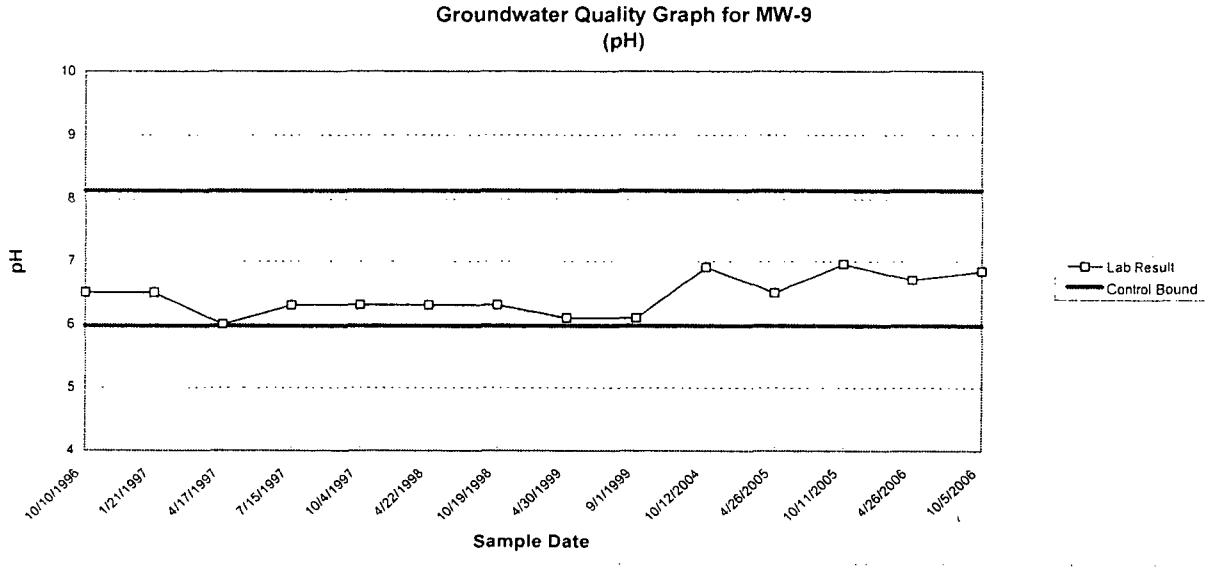


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

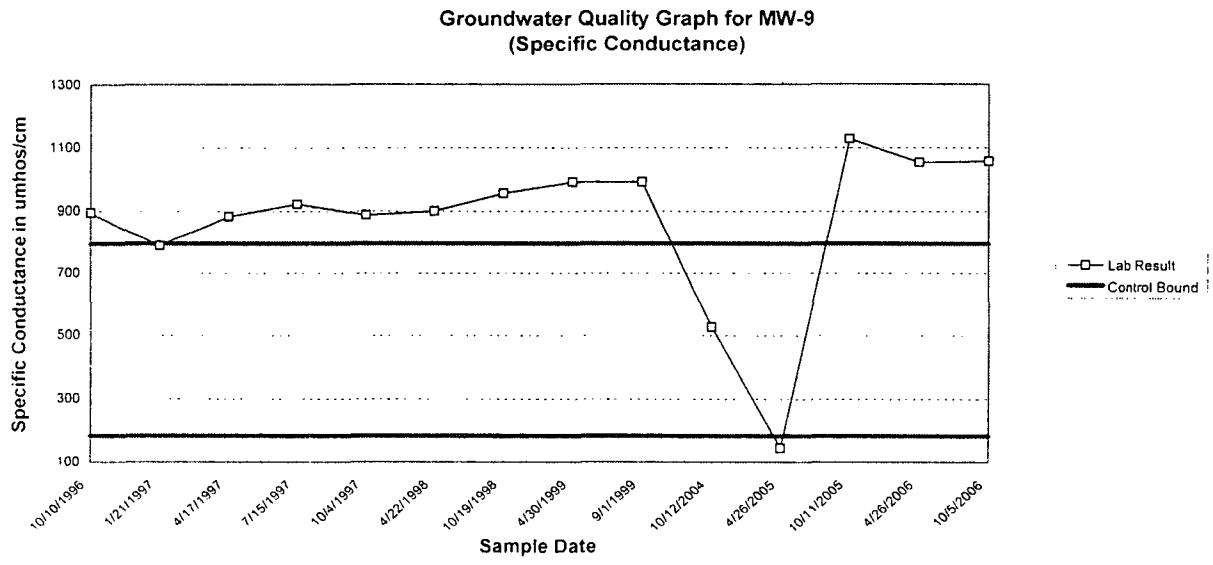


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-9

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
TERRACON PROJECT NO. 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-8* *(Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE										
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-8 Standard Deviation	MW-8 Mean	10/11/1996	1/21/1997	4/17/1997	7/15/1997	10/4/1997	4/22/1998	10/19/1998	4/30/1999	9/1/1999	4/12/2000	10/17/2000
Laboratory Parameters															
Chloride (mg/l)	4.823	0.634	11.560	18.64	12	12	13	15	11	11	12	12	10	8.4	6.2
Chemical Oxygen Demand (mg/l)	8.202	0.000	2.766	4.24	**2.5**	7.9	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	5.0	**2.5**
Ammonia Nitrogen (mg/l)	0.100	0.100	0.023	0.10	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.069	0.08	**0.05**	0.13	**0.05**	**0.05**	0.18	**0.05**	**0.05**	**0.05**	0.33	0.19	**0.05**
Benzene (µg/l)	0.250	0.250	0.678	0.86	2.8	2.2	**0.25**	1.2	1.53	1.1	1.3	1.3	1.0	0.72	0.95
1,2-Dichloroethane (µg/l)	0.404	0.051	0.873	2.10	3	2.8	**0.2**	2.8	2.8	3.3	2.6	3.4	2.3	3.0	2.1
1,1-Dichloroethene (µg/l)	1.000	1.000	3.028	1.69	14.2	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	-	**1.0**	**1.0**	-
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.000	0.50	**0.5**	**0.5**	**0.5**	**0.5**	-	-	-	-	-	-	-
Trichloroethene (µg/l)	0.500	0.500	6.118	10.24	21.4	20.8	18.6	17.1	15.6	16.4	16.1	14.1	11.8	9.8	9.8
Phenols, Total (mg/l)	0.010	0.010	0.004	0.01	-	-	-	-	0.022	-	**0.01**	-	**0.01**	-	**0.01**
Total Organic Halogens (mg/l)	0.005	0.005	0.026	0.08	-	-	-	-	0.114	-	0.056	-	0.112	-	0.103
Field Parameters															
pH	8.1	6.0	0.354	6.50	6.6	6.4	6.2	6.3	6.2	6.3	6.2	6.1	5.9	5.8	6.2
Specific Conductance (µs/cm)	793	183	288.158	947.35	923	823	896	929	888	945	1003	1050	1092	970	942

NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory detection limt (quantitative limit) for parameters not detected.
3) One-half of the quantitative limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the quantitative limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-8* *(Down-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE											
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-8 Standard Deviation	MW-8 Mean	4/25/2001	10/23/2001	4/28/2002	10/6/2002	4/3/2003	10/7/2003	4/30/2004	10/12/2004	4/26/2005	10/11/2005	4/26/2006	10/5/2006
Laboratory Parameters																
Chloride (mg/l)	4.823	0.634	11.560	18.64	9.4	21.6	55.4	26.7	14.2	21.6	14.3	22.8	36.0	37.2	23.9	23
Chemical Oxygen Demand (mg/l)	8.202	0.000	2.766	4.24	**2.5**	**2.5**	5.6	11	**2.5**	8.2	**2.5**	**2.5**	6.6	5.2	**2.5**	10.5
Ammonia Nitrogen (mg/l)	0.100	0.100	0.023	0.10	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	0.21	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.069	0.08	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Benzene (µg/l)	0.250	0.250	0.678	0.86	**0.25**	**0.25**	**0.25**	**0.25**	0.8	**0.25**	**0.25**	**0.25**	**0.25**	0.55	1.08	0.94
1,2-Dichloroethane (µg/l)	0.404	0.051	0.873	2.10	2.7	2.3	1.9	1.61	**0.2**	1.55	1.39	1.21	1.3	1.97	1.93	1.83
1,1-Dichloroethene (µg/l)	1.000	1.000	3.028	1.69	-	-	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.000	0.50	-	-	-	-	-	-	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Trichloroethene (µg/l)	0.500	0.500	6.118	10.24	7.8	7.3	6.4	7.0	9.5	5.02	5.97	4.06	3.61	3.29	1.46	2.61
Phenols, Total (mg/l)	0.010	0.010	0.004	0.01	-	**0.01**	**0.01**	**0.01**	**0.01**	-	**0.01**	-	**0.01**	-	**0.01**	-
Total Organic Halogens (mg/l)	0.005	0.005	0.026	0.08	-	0.075	0.077	0.072	0.074	-	0.026	-	0.071	-	0.0973	-
Field Parameters																
pH	8.1	6.0	0.4	6.5	6.8	6.8	6.5	7	6.8	7.1	6.5	6.8	6.7	6.8	6.65	6.88
Specific Conductance (µs/cm)	793	183	288	947	1034	538	984	895	1060	1115	832	563	90	1529	1337	1351

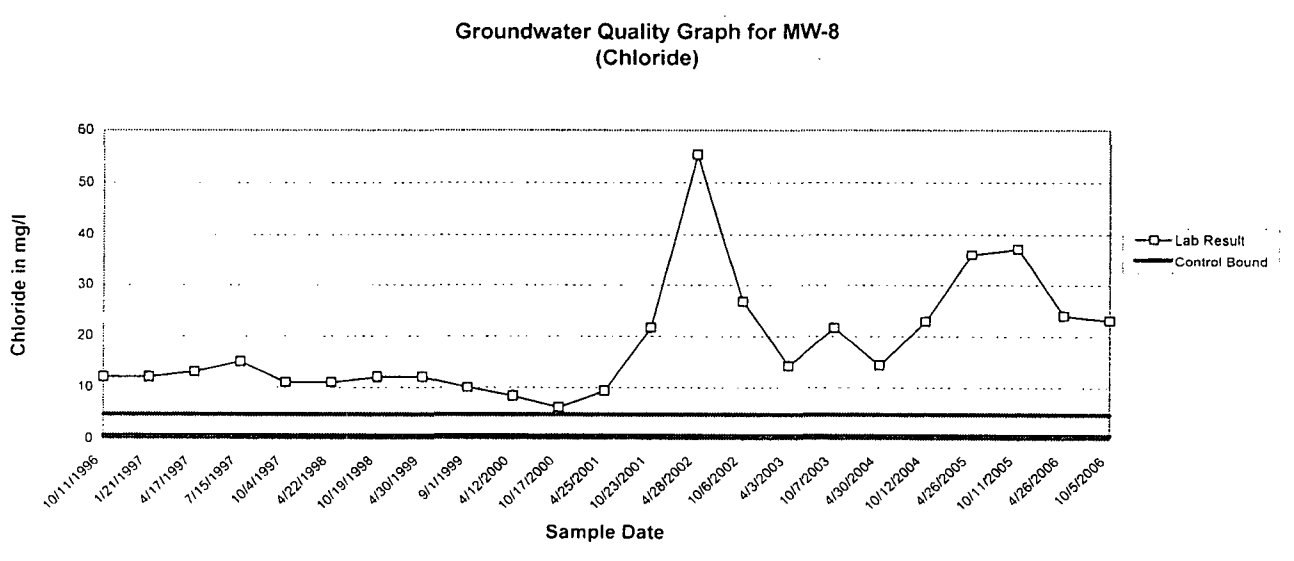
NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory quantitative limit for parameters not detected.
3) One-half of the quantitative limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the quantitative limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



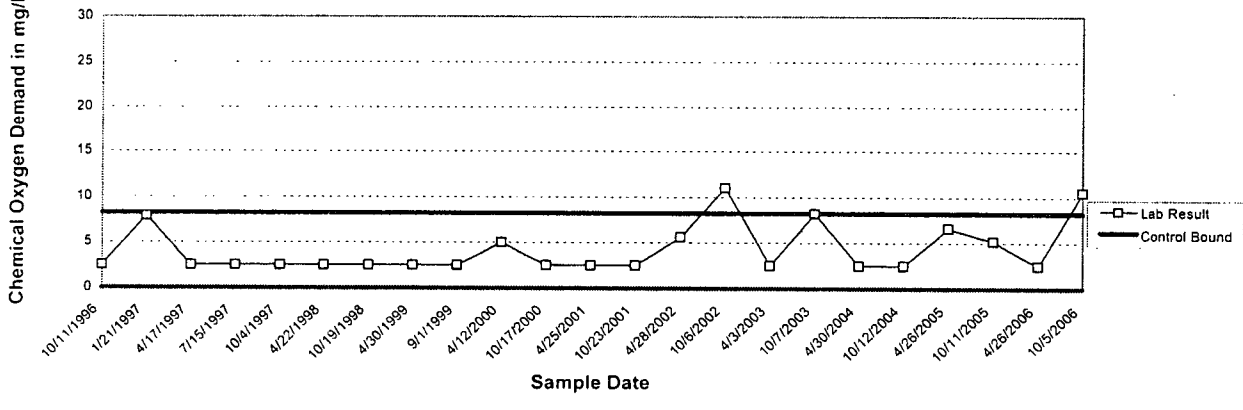
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-8
(Chemical Oxygen Demand)



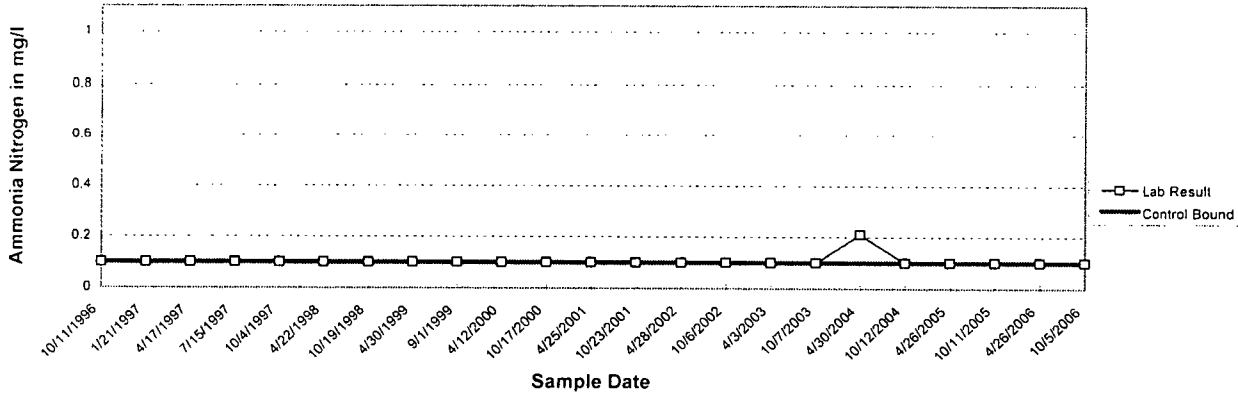
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-8
(Ammonia Nitrogen)

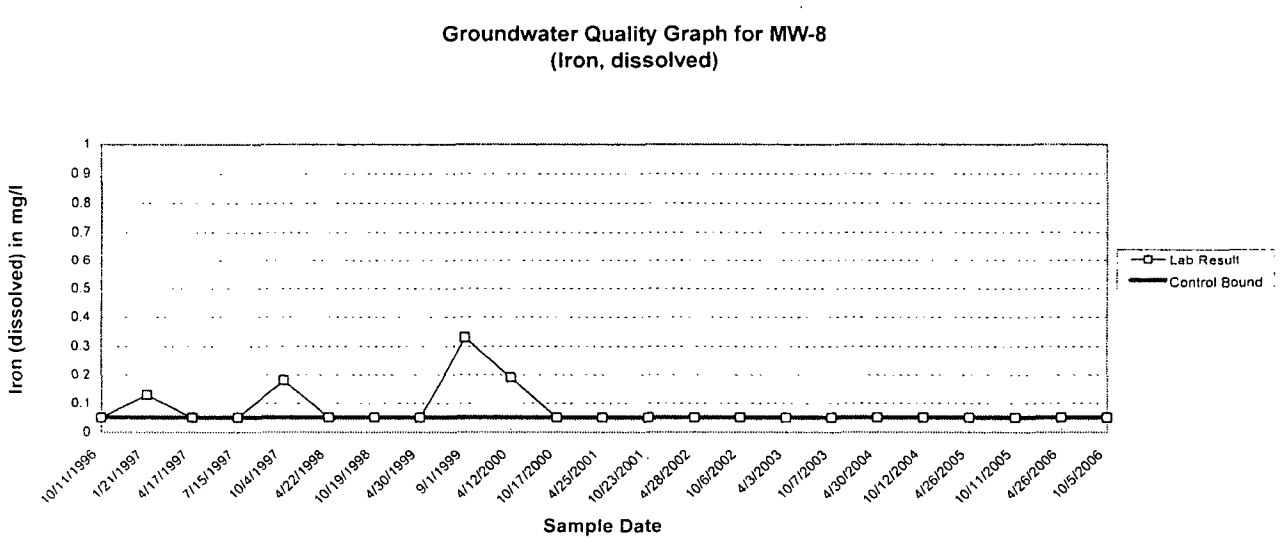


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

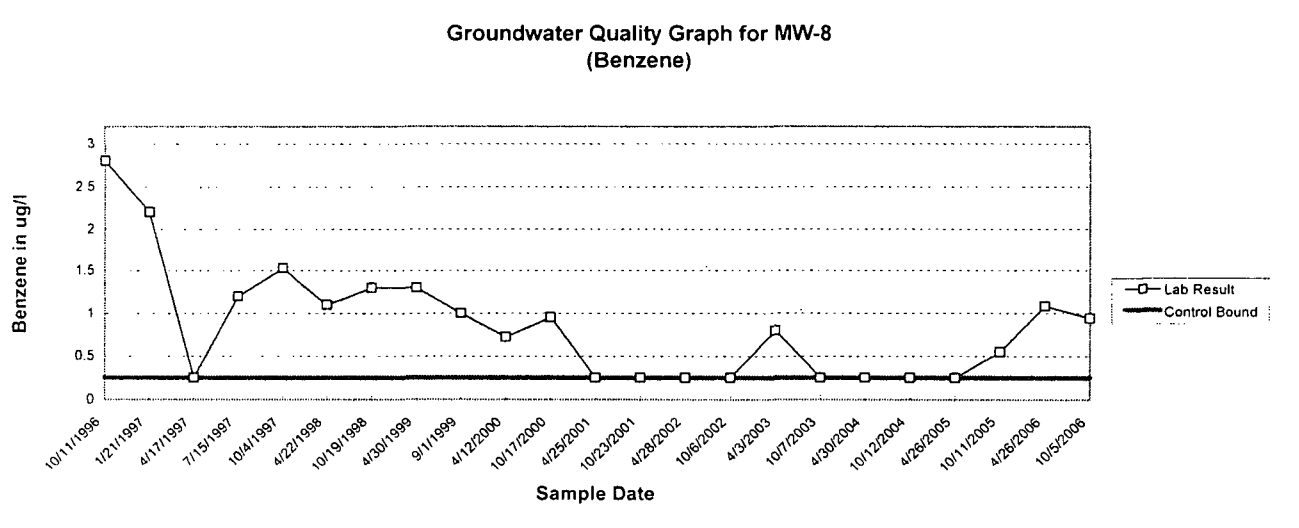


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



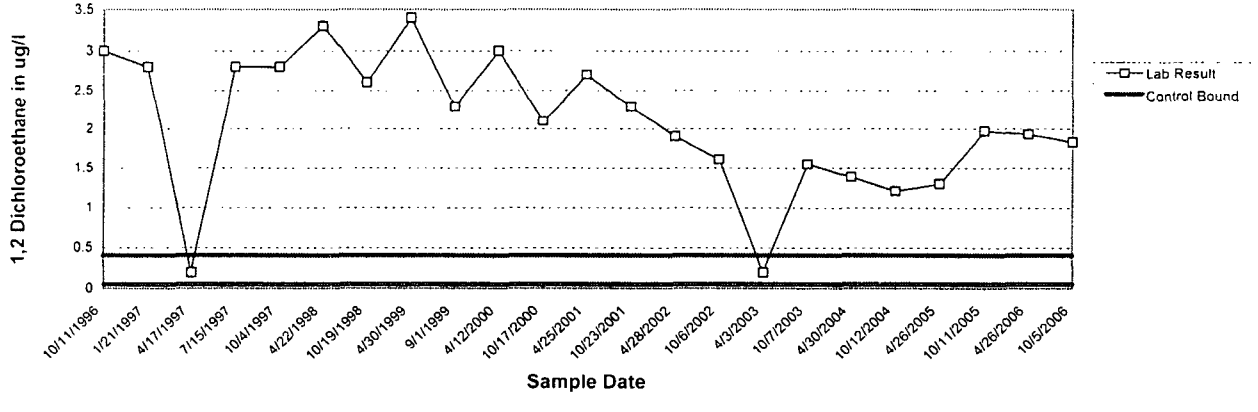
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-8
(1,2 Dichloroethane)

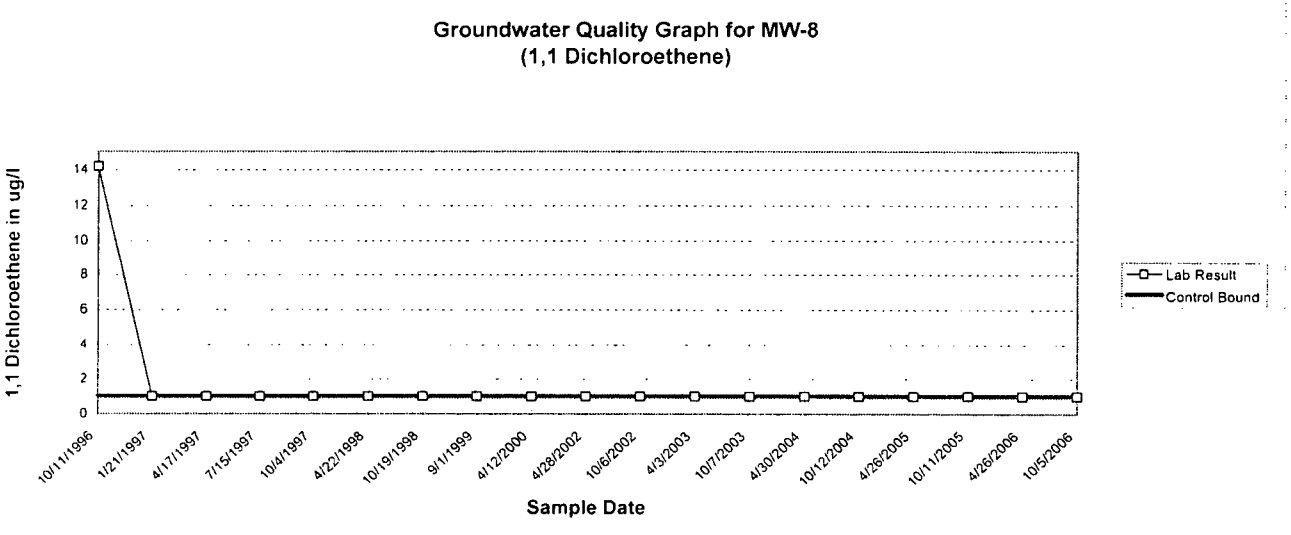


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

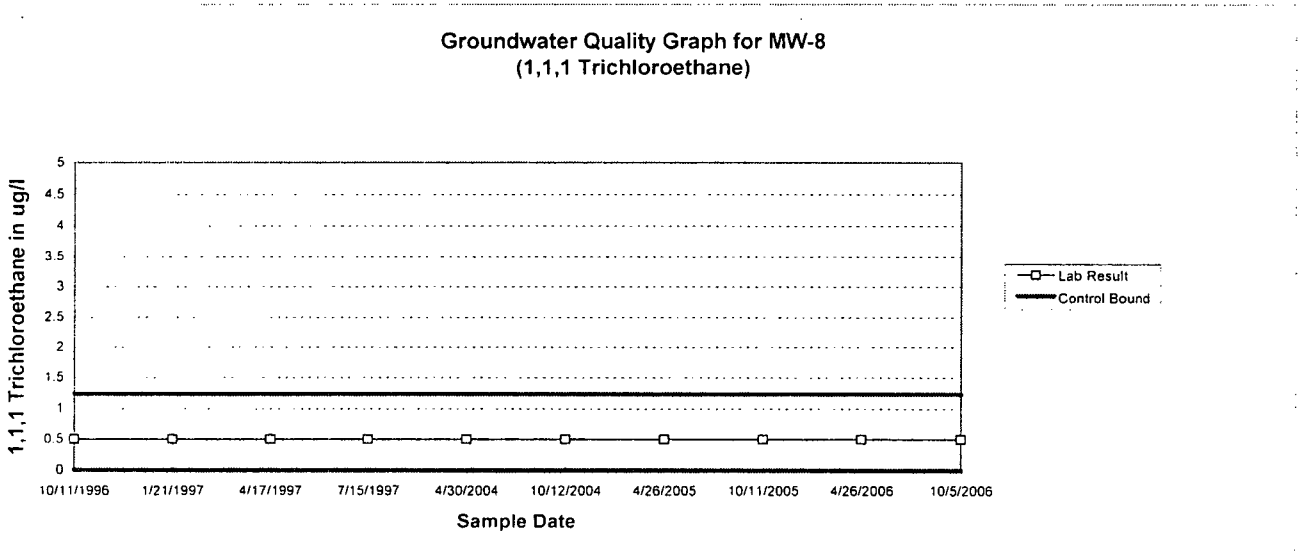


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



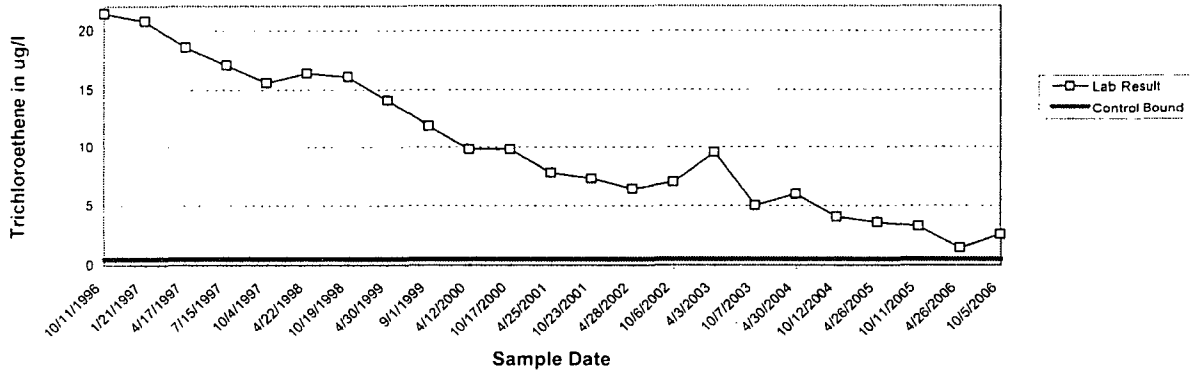
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-8
(Trichloroethene)

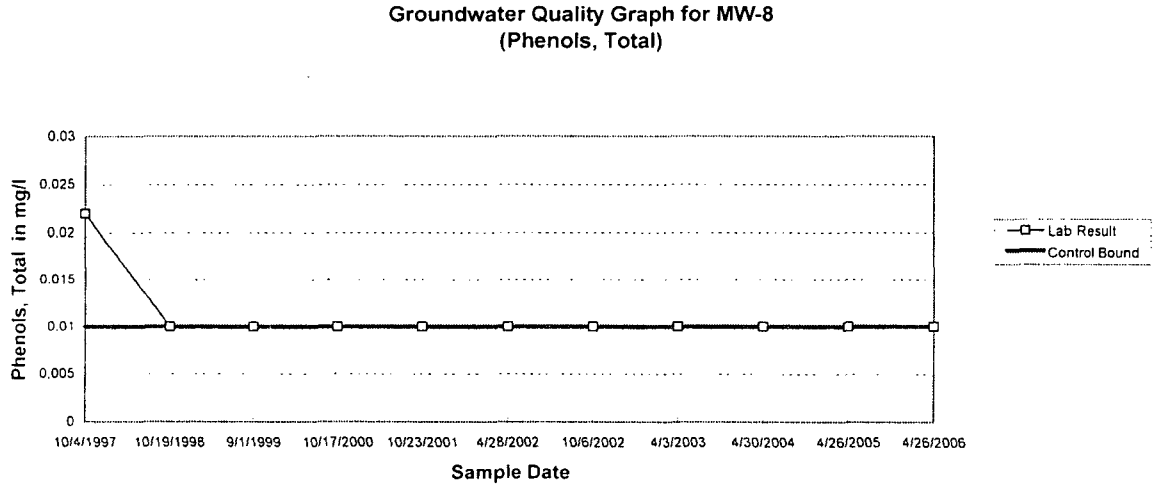


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

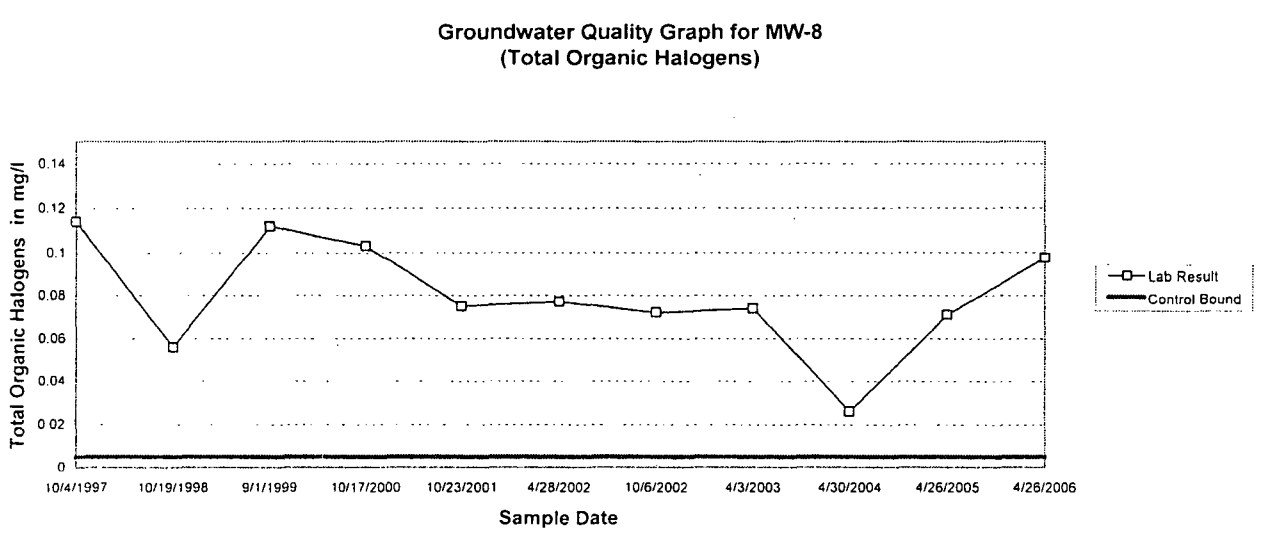


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

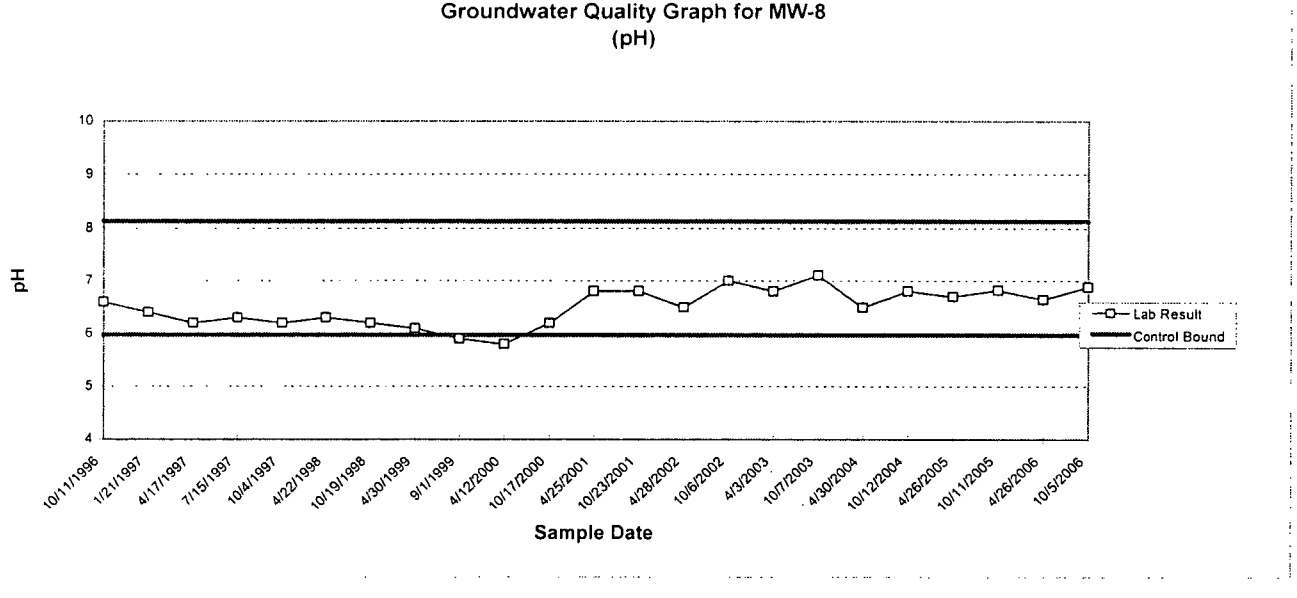


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

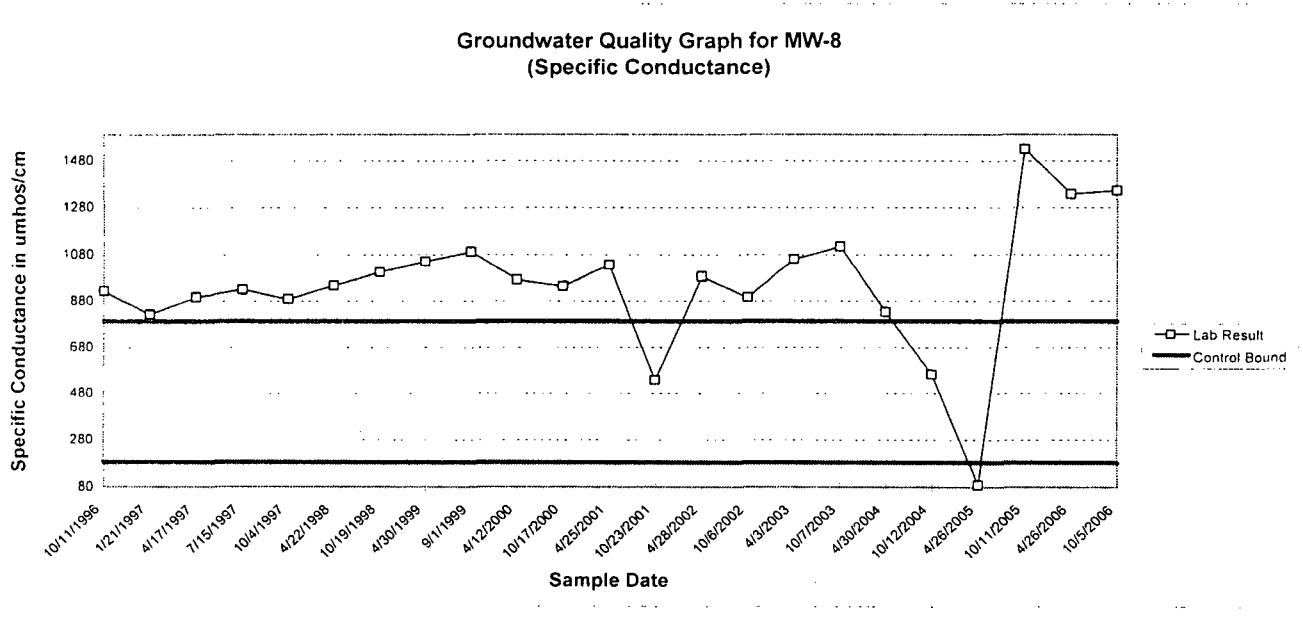


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-8

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-7* *(Up-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE										
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-7 Standard Deviation	MW-7 Mean	7/12/1996	10/10/1996	1/21/1997	4/17/1997	10/4/1997	4/22/1998	10/19/1998	4/30/1999	9/1/1999	4/12/2000	10/17/2000
Laboratory Parameters															
Chloride (mg/l)	4.823	0.634	1.970	5.776	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	6.9	6.6	6.7	5.9	6.4	5.5
Chemical Oxygen Demand (mg/l)	8.202	0.000	8.353	5.865	42.0	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**
Ammonia Nitrogen (mg/l)	0.100	0.100	0.035	0.110	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.037	0.063	**0.05**	**0.05**	**0.05**	**0.05**	0.12	**0.05**	**0.05**	**0.05**	**0.05**	0.13	**0.05**
Benzene (µg/l)	0.250	0.250	0.239	0.505	**0.5**	**0.5**	**0.25**	**0.25**	0.75	0.74	0.81	0.8	**0.25**	0.8	**0.25**
1,2-Dichloroethane (µg/l)	0.404	0.051	3.958	1.391	10.6	16.6	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**
1,1-Dichloroethene (µg/l)	1.000	1.000	0.158	0.947	**0.5**	**0.5**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	-	**1.0**	**1.0**	-
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.000	0.500	**0.5**	**0.5**	**0.5**	**0.5**	-	-	-	-	-	-	-
Trichloroethene (µg/l)	0.500	0.500	2.947	8.556	4.7	5.1	6.6	12.2	9.8	10.9	8.2	12.5	8.2	8.4	6.4
Phenols, Total (mg/l)	0.010	0.010	0.000	0.010	-	-	-	-	**0.01**	-	**0.01**	-	**0.01**	-	**0.01**
Total Organic Halogens (mg/l)	0.005	0.005	0.019	0.077	-	-	-	-	0.095	-	0.051	-	0.104	-	0.067
Field Parameters															
pH	8.1	6.0	0.365	6.382	6.1	6.5	6.5	6	6.2	6.1	6.2	6.1	5.9	5.6	6
Specific Conductance (µs/cm)	793	183	253.812	1104.000	738	870	840	919	904	1001	1050	1094	1127	1041	1002

NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory quantitative limit for parameters not detected.
3) One-half of the quantitative limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the quantitative limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.
6) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

SAMPLE LOCATION NO. *MW-7* *(Up-gradient)*

ANALYSIS PERFORMED BY: *TestAmerica Laboratories* *SAMPLED BY:* *Plymouth County Landfill Personnel*

PARAMETER	Statistical Considerations				SAMPLE DATE											
	Upper Control Limit via MW-17	Lower Control Limit via MW-17	MW-7 Standard Deviation	MW-7 Mean	4/25/2001	10/23/2001	4/28/2002	10/6/2002	4/3/2003	10/7/2003	4/30/2004	10/12/2004	4/26/2005	10/11/2005	4/26/2006	10/5/2006
Laboratory Parameters																
Chloride (mg/l)	4.823	0.634	1.970	5.776	5.9	7.5	7.5	6.2	6.1	8.2	8.8	7.9	5.7	5.3	5.9	7.34
Chemical Oxygen Demand (mg/l)	8.202	0.000	8.353	5.865	**2.5**	**2.5**	7.3	9.3	7.3	**2.5**	8.9	**2.5**	5.4	**2.5**	5.5	11.7
Ammonia Nitrogen (mg/l)	0.100	0.100	0.035	0.110	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	0.23	0.21	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Iron, dissolved (mg/l)	0.050	0.050	0.037	0.063	0.2	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**
Benzene (µg/l)	0.250	0.250	0.239	0.505	0.6	1.0	0.5	**0.25**	**0.25**	0.56	0.6	0.66	**0.25**	**0.25**	**0.25**	0.54
1,2-Dichloroethane (µg/l)	0.404	0.051	3.958	1.391	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.5**	**0.5**
1,1-Dichloroethene (µg/l)	1.000	1.000	0.158	0.947	-	-	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
1,1,1-Trichloroethane (ug/l)	1.231	0.000	0.000	0.500	-	-	-	-	-	-	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Trichloroethene (µg/l)	0.500	0.500	2.947	8.556	8.4	10.7	12.0	13.4	10.4	10.7	11.0	7.4	3.6	2.94	5.97	7.26
Phenols, Total (mg/l)	0.010	0.010	0.000	0.010	-	**0.01**	**0.01**	**0.01**	**0.01**	-	**0.01**	-	**0.01**	-	**0.01**	-
Total Organic Halogens (mg/l)	0.005	0.005	0.019	0.077	-	0.083	0.086	0.093	0.073	-	0.085	-	0.044	-	0.0638	-
Field Parameters																
pH	8.1	6.0	0.4	6.4	6.7	6.7	6.3	6.5	6.7	7.1	-	6.5	6.4	6.7	6.71	6.9
Specific Conductance (µs/cm)	793	183	254	1104	1147	1102	784	1232	1127	910	-	1495	1765	1443	1283	1414

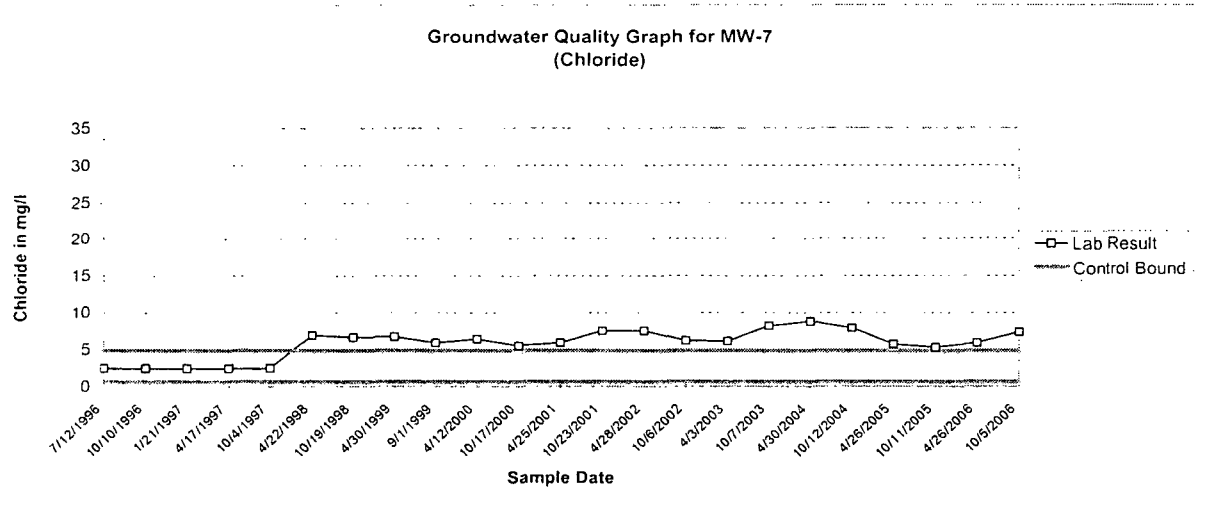
NOTE:

1) Statistical analysis included VOC chemicals that exhibited detectable concentrations during background monitoring.
2) Results shown in bold represent one-half of the laboratory quantitative limit for parameters not detected.
3) One-half of the quantitative limit was used for non-detected parameters to compute their respective control limits (mean +/- two times the standard deviation for the chemicals observed at MW-17).
4) One-half of the quantitative limit was plotted for non-detectable parameters.
5) A lower control limit of zero (0) was used for those parameters in which a negative lower control limit was calculated.

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

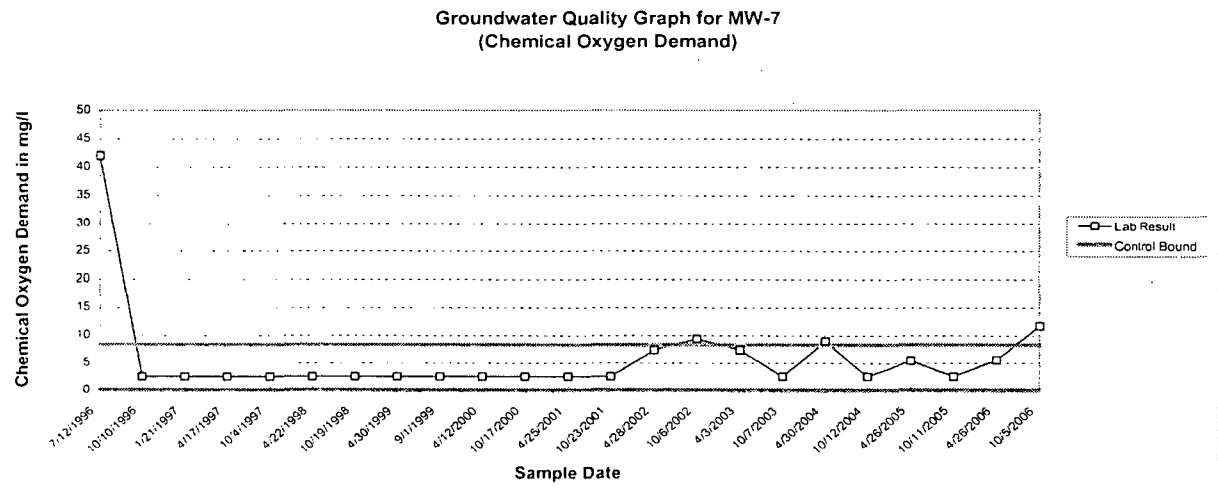


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

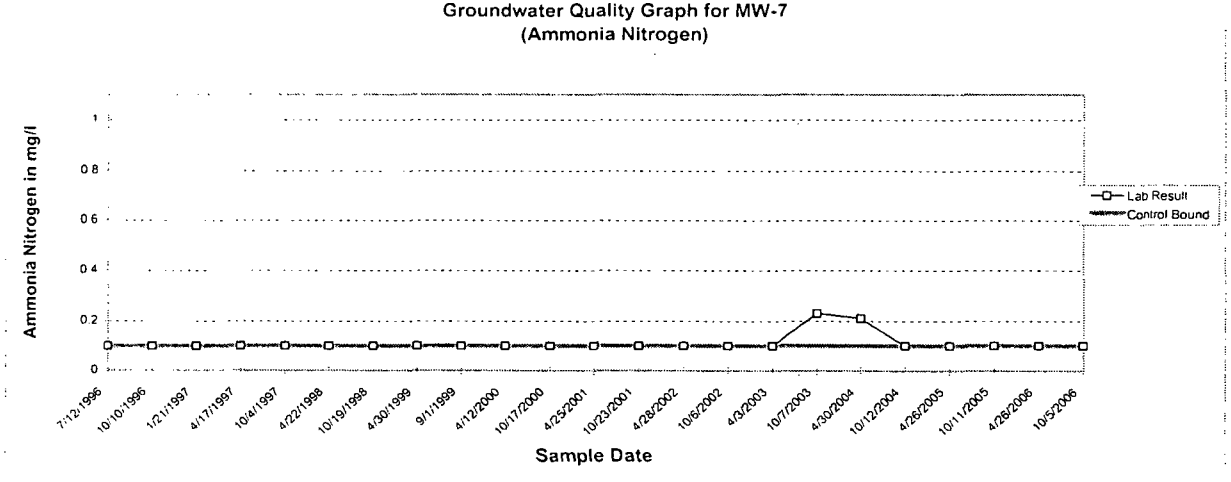


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

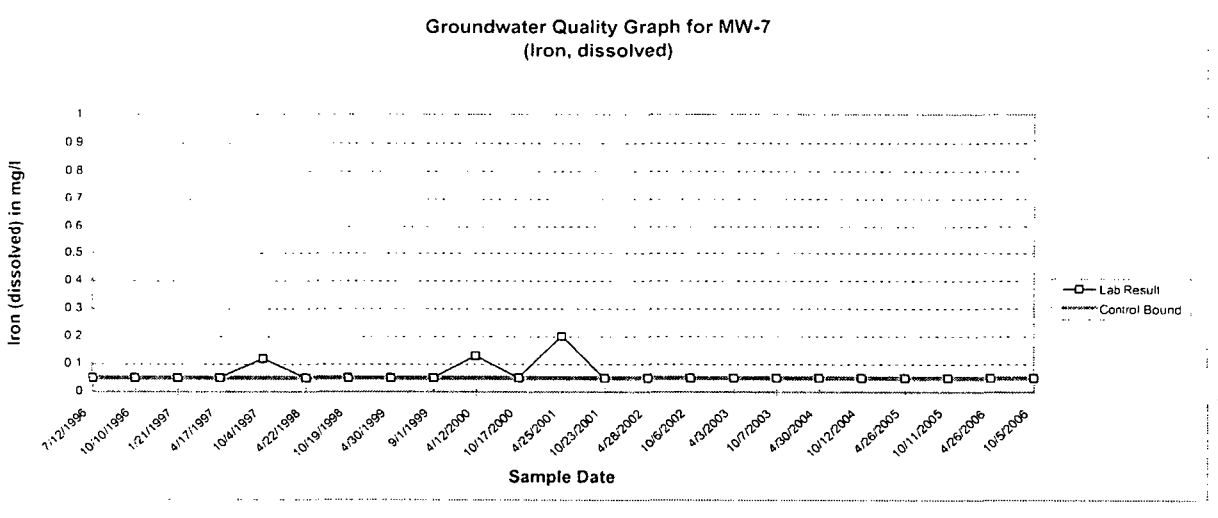


NOTE.
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

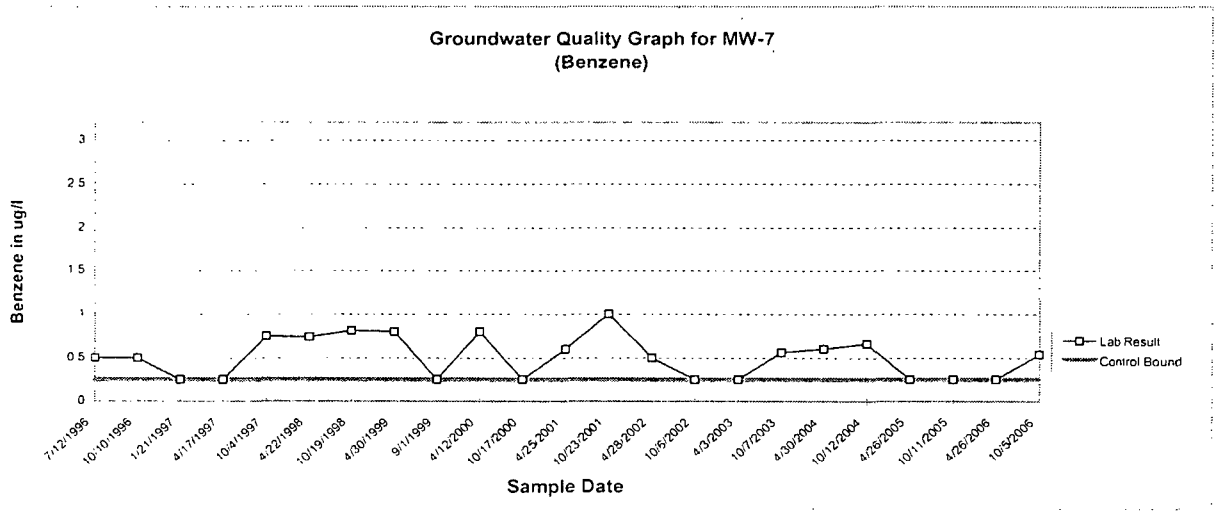


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

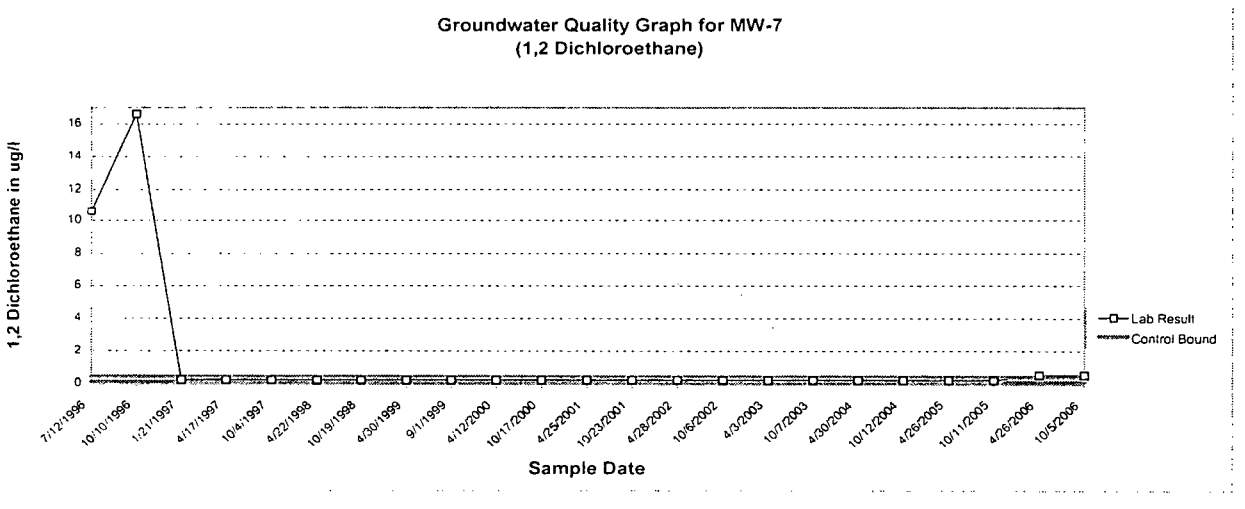


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

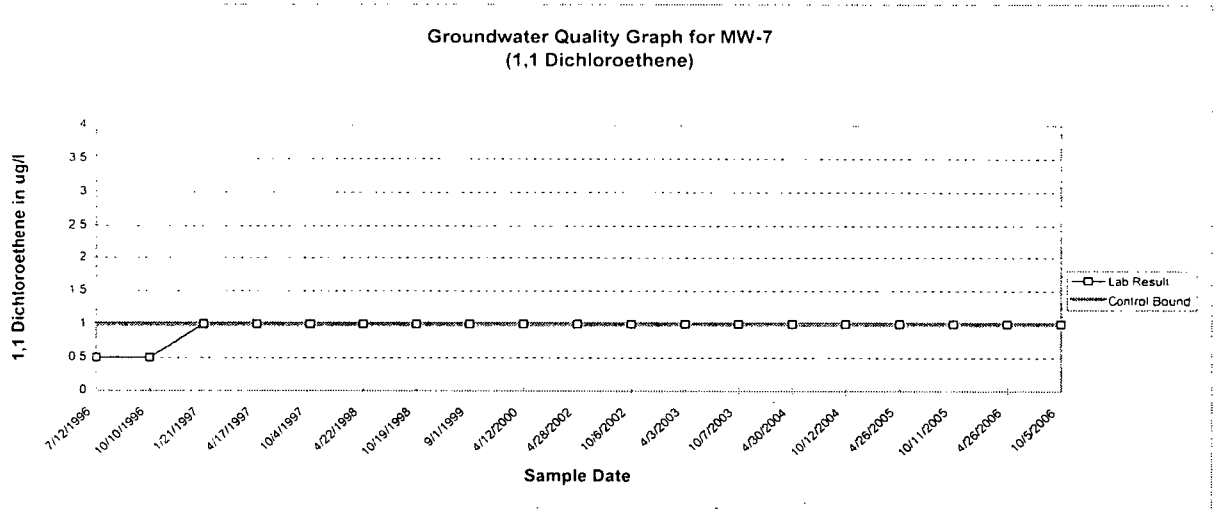


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

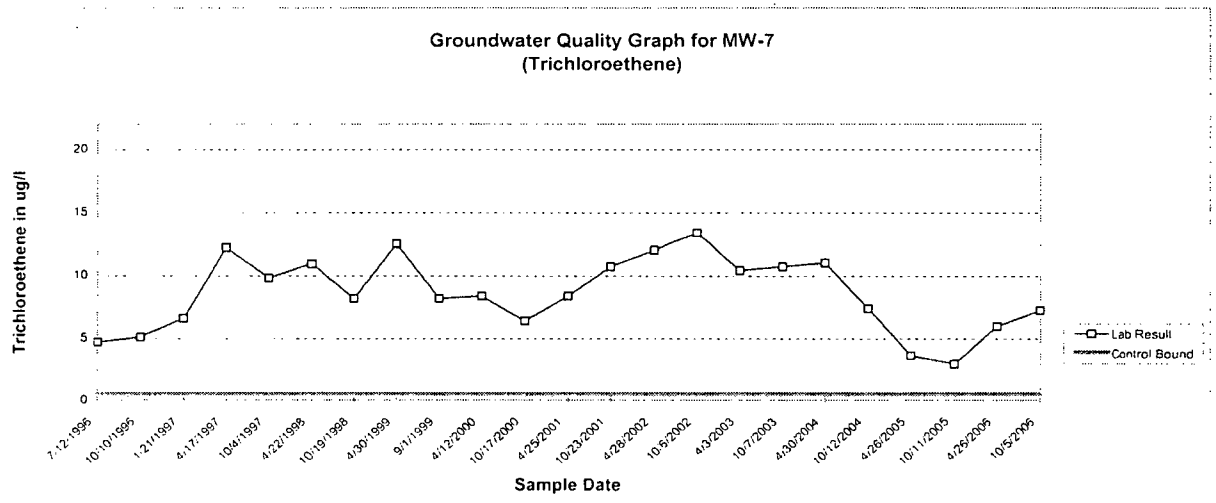


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

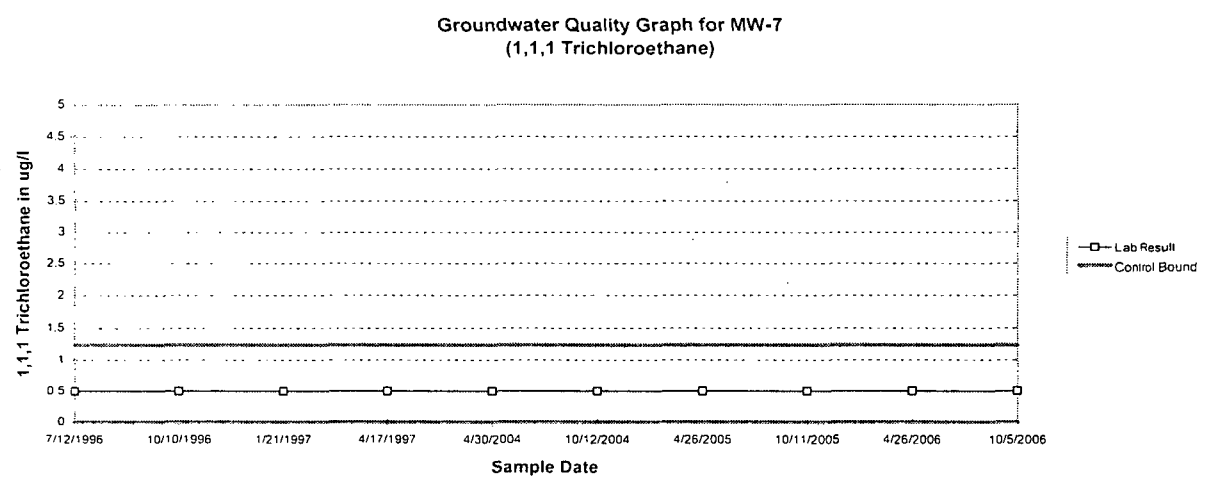


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



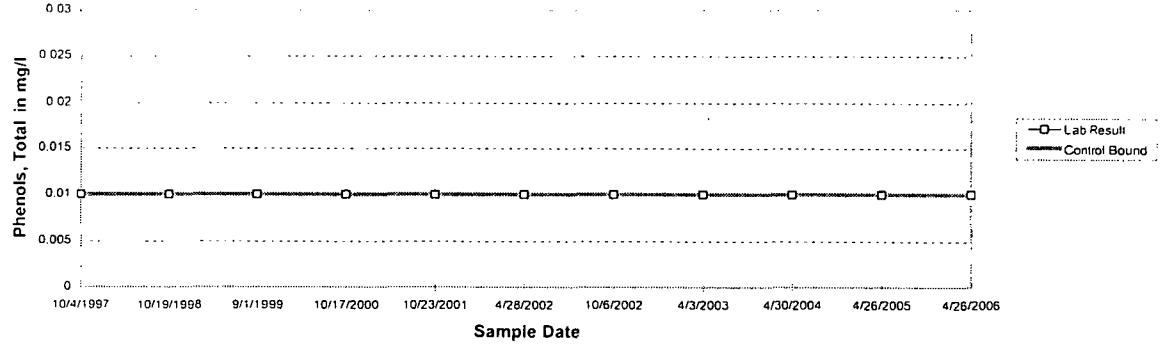
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-7
(Phenols, Total)

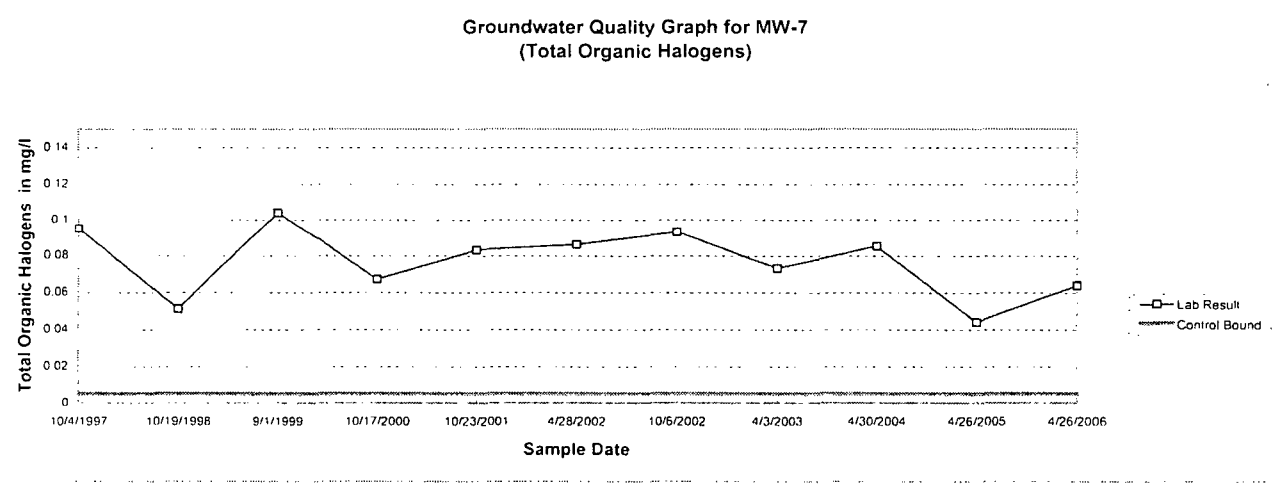


NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).
3) One-half of the quantitative limit was plotted for non-detectable parameters.

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

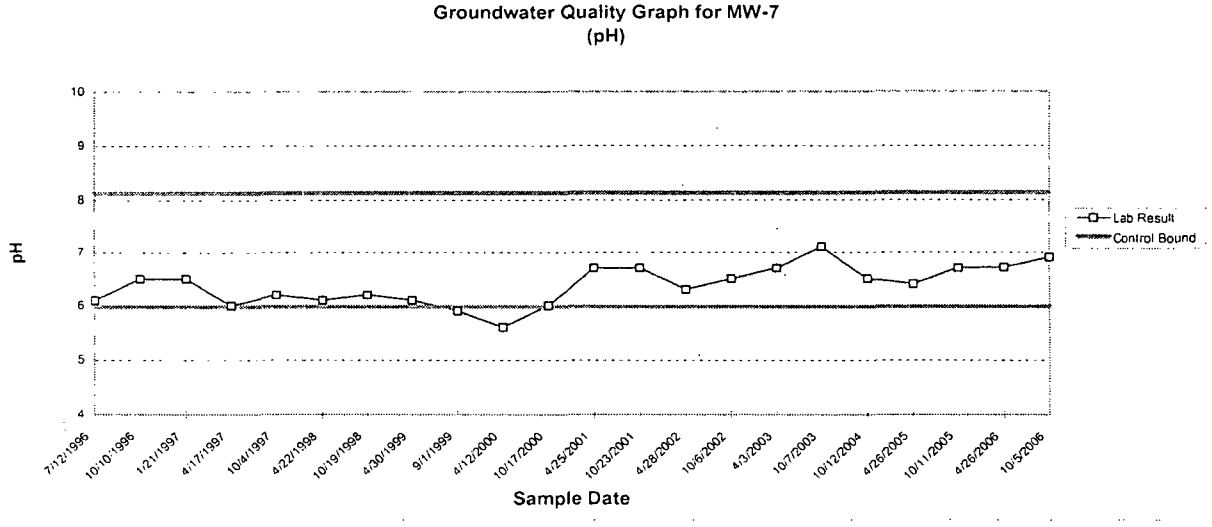


NOTE
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.
2) The same non-detectable concentration results for MW-17 resulted in a single control bound (i.e. there was no deviation from the mean of the data).

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET



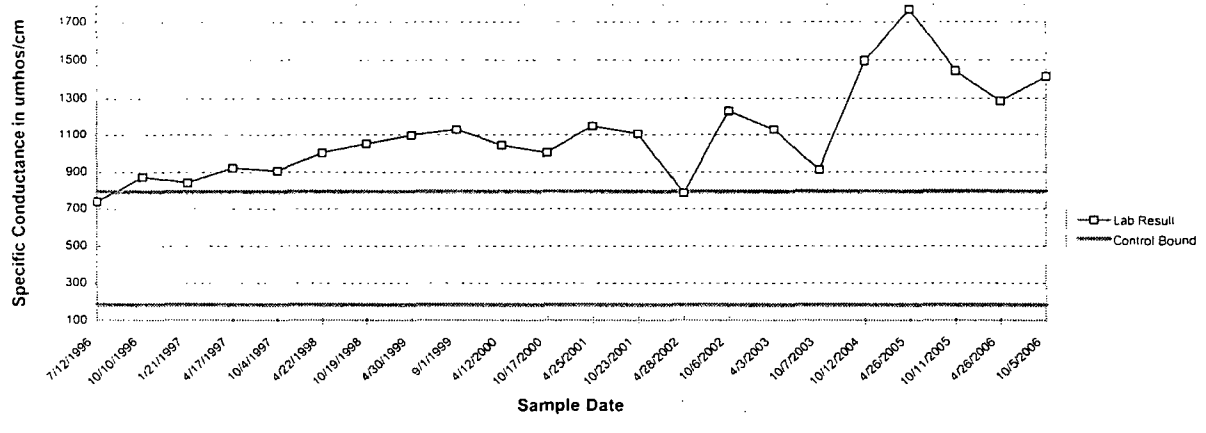
NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

ANALYSIS SHEET MW-7

PLYMOUTH COUNTY LANDFILL
GROUNDWATER SAMPLING AND ANALYSIS
PROJECT NO. TERRACON 40905033

SEMI-ANNUAL, ANNUAL, AND SELECT VOC PARAMETERS STATISTICAL ANALYSIS SHEET

Groundwater Quality Graph for MW-7
(Specific Conductance)



NOTE:
1) Results from Monitoring Well MW-17 (up-gradient well) were used to compute control limits.

Appendix C

TABLE 1
Plymouth County Landfill
Terracon Project No. 40905033

Summary of Groundwater Elevation Measurements

Measurement Dates			December 2005		January 18, 2006		February13, 2006		March 10, 2006	
Location	TOC Elevation (feet)	Screened Interval Elevation (feet)	Depth to Water (feet)	Groundwater Elevation (feet)	Depth to Water (feet)	Groundwater Elevation (feet)	Depth to Water (feet)	Groundwater Elevation (feet)	Depth to Water (feet)	Groundwater Elevation (feet)
MW-7	1325.79	1303.4-1293.4	NM	NM	26.14	1299.65	26.57	1299.22	27.10	1298.69
MW-8	1314.12	1296.7-1286.7	NM	NM	21.29	1292.83	21.35	1292.77	21.55	1292.57
MW-9	1291.83	1277.1-1267.1	NM	NM	24.00	1267.83	24.13	1267.70	24.29	1267.54
MW-10	1264.66	1242.0-1232.0	NM	NM	29.28	1235.38	29.40	1235.26	29.60	1235.06
MW-11	1285.62	1258.0-1248.0	NM	NM	30.34	1255.28	30.34	1255.28	30.62	1255.00
MW-12	1333.20	1290.3-1280.3	NM	NM	45.10	1288.10	45.15	1288.05	45.23	1287.97
MW-13	1266.67	1244.8-1229.8	NM	NM	26.91	1239.76	27.00	1239.67	27.13	1239.54
MW-14	1302.41	1267.4-1252.4	NM	NM	43.70	1258.71	43.86	1258.55	44.28	1258.13
MW-15	1322.16	1294.4-1279.4	NM	NM	33.78	1288.38	33.92	1288.24	33.95	1288.21
MW-16	1330.02	1309.0-1294.0	NM	NM	30.00	1300.02	30.59	1299.43	31.00	1299.02
MW-17	1319.12	1301.1-1286.1	NM	NM	19.40	1299.72	19.79	1299.33	20.01	1299.11
MW-18	NM	NM	NM	NM	51.72		51.61		51.66	

NOTES:
TOC = top of casing elevation (feet).
NM = not measured.
Bold numbers represent water levels outside screened intervals.
Elevation survey data has not been generated for well MW-18.

TABLE 1
Plymouth County Landfill
Terracon Project No. 40905033

Summary of Groundwater Elevation Measurements

Measurement Dates			April 26, 2006		May 2006		June 15, 2006		July 24, 2006	
Location	TOC Elevation (feet)	Screened Interval Elevation (feet)	Depth to Water (feet)	Groundwater Elevation (feet)	Depth to Water (feet)	Groundwater Elevation (feet)	Depth to Water (feet)	Groundwater Elevation (feet)	Depth to Water (feet)	Groundwater Elevation (feet)
MW-7	1325.79	1303.4-1293.4	25.77	1300.02	NM	NM	23.94	1301.85	23.80	1301.99
MW-8	1314.12	1296.7-1286.7	20.00	1294.12	NM	NM	19.45	1294.67	20.56	1293.56
MW-9	1291.83	1277.1-1267.1	21.37	1270.46	NM	NM	21.13	1270.70	22.35	1269.48
MW-10	1264.66	1242.0-1232.0	29.17	1235.49	NM	NM	28.55	1236.11	28.59	1236.07
MW-11	1285.62	1258.0-1248.0	30.35	1255.27	NM	NM	28.86	1256.76	29.22	1256.40
MW-12	1333.20	1290.3-1280.3	45.20	1288.00	NM	NM	44.95	1288.25	44.99	1288.21
MW-13	1266.67	1244.8-1229.8	26.14	1240.53	NM	NM	25.65	1241.02	26.23	1240.44
MW-14	1302.41	1267.4-1252.4	44.53	1257.88	NM	NM	43.19	1259.22	42.76	1259.65
MW-15	1322.16	1294.4-1279.4	33.65	1288.51	NM	NM	33.68	1288.48	33.68	1288.48
MW-16	1330.02	1309.0-1294.0	29.60	1300.42	NM	NM	27.14	1302.88	27.00	1303.02
MW-17	1319.12	1301.1-1286.1	17.85	**1301.27**	NM	NM	17.40	**1301.72**	18.00	**1301.12**
MW-18	NM	NM	51.85		NM	NM	51.68		51.68	

NOTES:
TOC = top of casing elevation (feet).
NM = not measured.
Bold numbers represent water levels outside screened intervals.
Elevation survey data has not been generated for well MW-18.

TABLE 1
Plymouth County Landfill
Terracon Project No. 40905033

Summary of Groundwater Elevation Measurements

Measurement Dates			August 25, 2006		September 19, 2006		October 5, 2006		November 13, 2006	
Location	TOC Elevation (feet)	Screened Interval Elevation (feet)	Depth to Water (feet)	Groundwater Elevation (feet)	Depth to Water (feet)	Groundwater Elevation (feet)	Depth to Water (feet)	Groundwater Elevation (feet)	Depth to Water (feet)	Groundwater Elevation (feet)
MW-7	1325.79	1303.4-1293.4	24.57	1301.22	25.62	1300.17	25.85	1299.94	26.68	1299.11
MW-8	1314.12	1296.7-1286.7	21.56	1292.56	22.00	1292.12	22.37	1291.75	22.73	1291.39
MW-9	1291.83	1277.1-1267.1	22.90	1268.93	23.62	1268.21	22.67	1269.16	24.11	1267.72
MW-10	1264.66	1242.0-1232.0	28.99	1235.67	29.40	1235.26	29.47	1235.19	29.76	1234.90
MW-11	1285.62	1258.0-1248.0	29.82	1255.80	30.31	1255.31	30.32	1255.30	30.46	1255.16
MW-12	1333.20	1290.3-1280.3	45.03	1288.17	45.15	1288.05	45.23	1287.97	45.20	1288.00
MW-13	1266.67	1244.8-1229.8	26.88	1239.79	27.27	1239.40	27.10	1239.57	27.23	1239.44
MW-14	1302.41	1267.4-1252.4	42.98	1259.43	43.48	1258.93	43.70	1258.71	43.74	1258.67
MW-15	1322.16	1294.4-1279.4	33.84	1288.32	33.92	1288.24	34.00	1288.16	33.99	1288.17
MW-16	1330.02	1309.0-1294.0	28.32	1301.70	29.74	1300.28	29.95	1300.07	30.86	1299.16
MW-17	1319.12	1301.1-1286.1	18.77	1300.35	19.30	1299.82	19.00	1300.12	19.75	1299.37
MW-18	NM	NM	51.78		51.87		51.90		51.85	

NOTES:
TOC = top of casing elevation (feet).
NM = not measured.
Bold numbers represent water levels outside screened intervals.
Elevation survey data has not been generated for well MW-18.

TABLE 2

Plymouth County Landfill
Terracon Project 40905033

Summary of Leachate Measurements

Location	Measurement Dates											
	Dec 2005	Jan 18 2006	Feb 13 2006	Mar 10 2006	Apr 2006	May 2006	Jun 15 2006	Jul 24 2006	Aug 25 2006	Sep 19 2006	Oct 5 2006	Nov 17 2006
LW-1	NM	6	6	6	NM	NM	6	6	6	11	11	NM
LW-2	NM	12	12	12	NM	NM	12	11	11	12	15	NM
LW-3	NM	87	74	73	NM	NM	79	80	72	66	66	NM
LW-4	NM	0	0	0	NM	NM	0	0	0	0	0	NM

NOTES:

All Measurements in inches
Leachate levels measured by landfill personnel.
Blank fields indicate no data.
Values represent leachate thickness at bottom of each leachate well.

TABLE 3

Plymouth County Landfill
Terracon Project 40905033

Summary of Hydraulic Conductivities

DATE	MONITORING WELLS											
	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	MW-16	MW-17	MW-18
March 1991	2.00E-04	9.70E-06	1.40E-04	8.90E-06	6.10E-04	5.30E-05						
May 1998	1.78E-04	3.33E-05	3.81E-05	4.50E-03	3.89E-04	3.30E-05	1.43E-04	1.31E-04	5.31E-05	9.23E-06	1.29E-05	
November 2003	1.34E-04	1.09E-05			3.31E-04	1.83E-04	2.96E-04	1.94E-04	5.26E-05	2.88E-05	9.63E-06	

Hydraulic conductivity values given in units of centimeters per second (cm/sec).

Blank cells indicate no testing was performed.

Wells MW-13, MW-14, MW-15, MW-16 and MW-17 did not exist at the time of hydraulic conductivity testing in 1991.

Wells MW-9 and MW-10 had insufficient water for hydraulic conductivity testing in 2003.